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ABSTRACT

A project assessed the need and developed a curriculum for environmental technology (laboratory analysis and environmental sampling) in the emerging high technology centered around environmental safety and health in Texas. Initial data were collected through interviews by telephone and in person and through onsite visits. Additional data was collected through a task analysis/needs assessment survey of a representative sample taken from manufacturers in and outside the Rio Grande Valley and the independent environmental laboratories in the state. Onsite interviews with environmental technicians and professionals expanded or confirmed the information base. Results indicated a need for 568 technicians in laboratory analysis and 276 in environmental sampling over the next 5 years. Employers indicated two-year technical and community colleges as the minimum level of formal education for entry-level employment. A curriculum was drafted and revised to incorporate committee input and results of the needs assessment. In its final form, the proposed curriculum consisted of 10 environmental technology courses and 9 chemical technology courses and would involve 99 credit hours over 6 quarters or 72 credit hours over 4 semesters and 1 summer session. (The 18-page report is accompanied by these appendixes: steering committee minutes; survey and site visit results; sample population lists; curriculum and course descriptions; data tables, charts, and comparisons; 84-item bibliography; and guide to enviromental acronyms.) (YLB)

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ENVIRONMENTAL TECHNOLOGY
(Laboratory Analysis and Environmental Sampling)
Curriculum Development Project

FINAL REPORT

Texas State Technical College
Harlingen

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TEXAS STATE TECHNICAL COLLEGE HARLINGEN

ENVIRONMENTAL TECHNOLOGY
(Laboratory Analysis and Environmental Sampling)
Curriculum Development Project

FINAL REPORT

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Funded By: The Texas Higher Education Coordinating Board
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June 30, 1994

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ENVIRONMENTAL TECHNOLOGY
(LABORATORY ANALYSIS AND ENVIRONMENTAL SAMPLING)

EXECUTIVE SUMMARY

Texas State Technical College Harlingen was awarded a Carl D. Perkins Grant through the Higher Education Coordinating Board to develop a curriculum for an emerging high technology centered around Environmental Safety and Health. Mr. Oscar V. Hinojosa, Curriculum Coordinator, and Mr. Alfonso Guillen, Chairman, Chemical Technology, carried out the project requirements of assessing the need and developing a curriculum for Environmental Technology (Laboratory Analysis and Environmental Sampling).

The objectives of this project were: (a) to determine the local and statewide labor market demand for these environmental emerging fields; (b) to conduct a task analysis representative of local and statewide training needs; and (c) to develop a curriculum which will best suit local and state training needs as specified by business and industry.

A steering committee made up of representatives from industry, independent laboratories, regulatory agencies (EPA and TNRCC) , and education was utilized to provide technical expertise, expert judgment, feedback and evaluation of each phase of the project. This was accomplished in three one-day meetings and when necessary by telephone.

Using several recent and related studies as a base to start from, initial data was collected through interviews by telephone and in person, and through on-site visits. Additional data was collected through a task analysis/needs assessment survey of a representative sample (781 organizations) taken from the manufacturers in and outside the Rio Grande Valley, and the independent environmental laboratories in the state. To expand and/or confirm the information base, on-site interviews were conducted with more than twenty-five environmental technicians and professionals representing manufacturing, independent laboratories and U.S. EPA.

The final results, on the basis of the 161 usable responses alone, indicated a **need for 568 technicians in laboratory analysis and 276 in environmental sampling** over the next five years. When employers were asked what is the minimum level of formal education for entry-level, **two-year technical and community colleges** received the greatest number of responses for both laboratory analysis and environmental sampling.

The first draft of a curriculum was based on preliminary results of the needs assessment and was presented to the advisory committee for review. A revised curriculum incorporated the input of the committee and the final results of the needs assessment. The revised curriculum was further refined in the third and last advisory committee meeting. The refined curriculum included refined course-competency

matrices, course descriptions and instructional objectives for each course.

The proposed curriculum in final form consists of ten Environmental Technology courses and nine Chemical Technology courses. The remaining courses consist of general education and interdepartmental courses for a total of 99 quarter credit hours over a period of six quarters. This curriculum was also converted to a semester-based curriculum. It consists of 72 semester credit hours over a period of four semesters and one summer session.

ENVIRONMENTAL TECHNOLOGY
(LABORATORY ANALYSIS AND ENVIRONMENTAL SAMPLING)

FINAL REPORT

Overview

Texas State Technical College Harlingen was awarded a Carl D. Perkins Grant through the Texas Higher Education Coordinating Board to do a needs assessment and to develop a curriculum for an emerging high technology centered around Environmental Safety and Health. Shortly after the work started, Environmental Laboratory Analysis surfaced as the area the project would focus on. The results and findings of this project will be made available to all public 2-year colleges of the state through this final report.

Environmental Technology, as a potential instructional program at the Associate of Applied Science level, is of great interest to TSTC Harlingen and is appropriate to the Role and Mission of the College as the following paragraphs indicate: Texas State Technical College Harlingen (TSTC Harlingen) is a residential, post-secondary, one and two-year vocational-technical college. Its role and mission, Chapter 135, Subchapter A, as Amended by Acts 1991, 72nd Leg., ch.287, §1, eff. Sep 1, 1991 reads, in part:

"The Texas State Technical College System is a coeducational two-year institution of higher education offering courses of study in technical-vocational education for which there is a demand within the State of Texas.

"The Texas State Technical College System shall contribute to the educational and economic development of the state of Texas by offering occupationally oriented programs with supporting academic coursework, emphasizing highly specialized advanced and emerging technical and vocational areas for certificates and associate degrees."

Introduction

Billions of tons of waste materials are produced in the U. S. every year. The quality of air, water, and soil, and the pollution and contamination of our environment in general have been growing concerns of citizen groups for decades. More recently environmental issues have received national attention in relationship with the North American Free Trade Agreement.

Throughout the U. S., the connection between free trade and the environment has been a topic of great concern, debate and speculation, particularly along the U. S.-Mexico border. The issues range from worker training and retraining needed to meet the industrial growth on both sides, to the detrimental effect to the U.S. side of the border caused by the

lack of effective environmental regulation in Mexico[1]. The Rio Grande Valley finds itself in the middle of the debate. With a growing economy, a young bilingual population, and established technical training programs, the Rio Grande Valley has much to offer, and has critical needs in meeting the challenge. One thing seems to be clear: there is a need to determine what environmental education and training is required in the region and the state, and there is a need to develop curricula and programs that will meet those education and training requirements.

Background

In December, 1992, a Texas Higher Education Coordinating Board Advanced Technology Panel met to identify the technologies that will play an important role in the advancement of Texas economic development from 1993 through the year 2000 (Priority advanced technological businesses or industries). The panel identified Environmental Laboratory Analyst as one of the advanced and emerging technologies.

The Texas Innovation Network (TINS), in its September, 1992 report, listed as emerging occupations Laboratory Analyst/Environmental and Hazardous Materials Technical Coordinator. In this report, TINS outlined the competencies for both occupations. In April, 1993, the Texas Higher Education Coordinating Board included, in its priority listing for 1992-93, Environmental Laboratory Analyst as identified by the Coordinating Board's Advanced Technology Panel. The 1992-1993 Regional Labor Market Information Analysis Report, Valley Workforce Alliance # 21 (Quality Workforce Planning Committee) Report, Table 2, lists Hazardous Material Technician Coordinator as a potential growth industry vital to economic development of the Lower Rio Grande Valley. Hazardous Material Technology is a related field to Environmental Technology (Laboratory Analysis and Environmental Sampling).

It seems evident that environmental technologies have surfaced as high priority emerging technologies at the state and local levels. With the impact of growing manufacturing (maquiladora) industries and the free trade agreement initiatives on one side of the equation and a strong and high quality Chemical Technology program on the other, Texas State Technical College Harlingen (TSTC Harlingen) is ideally positioned for a leading role in the development of these technologies. TSTC took the first step early last year. A preliminary state-wide survey for Environmental Health and Safety Technology was conducted by the central systems research department in February, 1993. The results from this survey and the information provided in the Texas Innovation Network Report were used as preliminary base information for this study.

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[1]The Environmental Protection Agency is investigating environmental factors as a possible cause of the high rate of anencephaly and other neural-tube defects in the Rio Grande Valley.

The Environmental Technology study was originally proposed to focus on Environmental Laboratory Analyst and, if appropriate, the study would include the related occupation Hazardous Materials Technical Coordinator. This project would then principally address the high priority advanced and emerging occupation Environmental Laboratory Analyst. Environmental Laboratory Analyst would be used as a main component under the broader title Environmental Safety and Health Technology.

Studies Related to this Project.

In February, 1993, the Occupational and Institutional Research department, Texas State Technical College, Waco conducted a state-wide assessment of the environmental needs of manufacturing companies. The purpose was to determine the need for Environmental Safety and Health Technicians in Texas. The results of the survey, based on the 64 responses received (8% response rate), may be summarized as follows:

When asked about the areas of major concern to their companies, the response was hazardous materials followed by occupational safety and health, air quality and water quality.

When asked to identify their most pressing needs in terms of training, the response was knowledge of regulations followed by technical knowledge and current information.

The average salary of this type entry-level technician ranged from $9.78 per hour to $12.44 per hour.

The number of companies who recruited Environmental Safety and Health Technicians from two-year technical and community colleges was low.

Based on the results of the survey, the need for a comprehensive Environmental Safety and Health Technology program was not determined.

The National Center for Research in Vocational Education, University of California at Berkeley conducted an extensive national study entitled "Educational Needs and Trends of Environmental Hazardous Materials Technicians and Related Workers," as part of a 5.7 million dollar federal grant. The results of the study, published in December, 1992, selectively chosen as relevant to this project are abstracted as follows:

Environmental services together with hazardous waste generating organizations employ nearly two million workers.

The supply of trained technician-level personnel in the environmental management industry is not readily available, and the demand will increase in the near future.

Two-year colleges offer the most desirable level of education through (Associate) degree programs or through short courses.

The skill requirements for hazardous materials technicians and related workers are not well understood, and the set of specific tasks required are divergent. A list of more than 100 specific titles for environmental technicians and related workers resulted from interviews. Many jobs with different titles actually included the same duties.

The *Maquiladoras*, the term used for foreign-owned industrial plants in Mexico, have increased from 12 plants in 1965 to 1,490 in 1988.

Texas ranks higher than average as a contributor to industrial hazardous waste in the chemical industry and petroleum refining industries.

Nearly all managers of private sector organizations considered chemistry and biology to be very important.

The 1992 report by Texas Innovation Network mentioned earlier describes the process and method of arriving at their forecast of occupations expected to emerge and change in Texas. Under a subtitle of Energy and Environmental Technologies, this report describes Laboratory Analyst/Environmental as a technology requiring between one and four years of postsecondary education, with specialized training in areas such as waste management regulations and agricultural fields. The information provided for Laboratory Analyst/Environmental, like the information provided for other occupations listed in this report, includes a job description and a list of competencies. In their report TINS suggests that the emerging and changing occupations described therein be re-examined by educators and employers as part of the regional Quality Work Force Planning process.

In the 1989-90 school year, Texas State Technical College, Waco and the Center for Occupational Research and Development conducted a needs assessment and curriculum development study for Hazardous Materials Management Technician Training (HAZMAT), sponsored by the Texas Higher Education Coordinating Board. A Final Report was published in October, 1990. Results of this study that are related to this project are as follows:

Regulations, industrial processes, chemicals and industrial waste were areas in which HAZMAT technicians work most. These were also the areas for which companies had the greatest difficulty finding qualified technicians.

Baccalaureate degree ranked highest as the level of education the companies hire who fit the description given for HAZMAT technicians.

A great majority of respondents indicated a tremendous to moderate need for two-year postsecondary degree program that prepares HAZMAT technicians.

A great majority of respondents reported an approximate starting salary for HAZMAT technicians of $ 18,000 to $ 25,000.

An ERIC search by means of computer produced only one study related to this project. It was not, however, sufficiently related to be useful to this study.

Project Objectives

The objectives for the curriculum development project were listed in three coherent groups:

A. To determine the local and the statewide labor market demand for trained personnel in Environmental Safety and Health Technology (ESHT) and labor market demand for short courses for existing workers. To identify priorities in specialized areas within ESHT.

B. To conduct a task analysis representative of local and statewide needs, and to determine the skills and knowledge requirements for ESHT. To develop and validate the program purpose and program objectives. Program objectives shall be stated as occupational competencies and/or skill and knowledge requirements, and shall be based on results of state-wide and local task surveys. Occupational competencies which are related shall be grouped into courses.

C. To develop a curriculum. The curriculum may include options and/or exit points from an existing program, and will include course descriptions, course sequence, weekly lecture and laboratory hours, contact hours, and credit hours for all courses. This shall be done in both the semester and quarter formats.

Methodology

The project activities for curriculum development consisted of three sequential and overlapping parts corresponding to the three project objectives: (1) conducting a needs assessment, (2) conducting a task analysis, and (3) developing a curriculum. The project staff was made up of a project director, a subject matter specialist, and secretarial support. Provisions were made for internal and external evaluation of the project activities and products.

A steering committee was formed to: (1) provide technical expertise relating to needs assessment and labor market demand, task inventories; (2) provide expert judgment and feedback in the evaluation of each part of the project; and (3) review

and validate the results, findings and conclusions of this project. This committee was composed of representatives from the chemical and petrochemical manufacturing industry, independent laboratories, regulatory agencies and higher education.

Conducting Needs Assessment: The initial activities of this part of the project consisted of conducting research into the issues and needs in the area of Environmental Safety and Health Technology and meeting with and interviewing professionals and experts in the environmental field including industry experts and environmental technology training specialists. The purpose of these interviews and meetings was (1) to identify a pool of potential steering (advisory) committee members, (2) to gather preliminary information regarding priority areas of environmental technology specialization, trends in the environmental industry, and (3) to gather a preliminary list of skills and knowledge required for each of the priority specialized areas. With this information and the information obtained from previous studies and reports, a survey instrument was prepared, reviewed by two experts in the field, and taken to the first steering committee meeting for validation and refinement prior to mailing.

Conducting a Task Analysis: The second part of the project consisted of utilizing the results of the first part to develop and conduct a mail survey that was distributed to a much larger population, 781 employers of environmental technicians, in the State. The purpose of the survey was to determine the skills and knowledge requirements for Environmental Technicians, as well as the employment opportunities and need for the program. The preliminary results of this survey, based on the first 71 responses, were compiled, analyzed and tentative conclusions drawn. This information together with a preliminary curriculum was distributed to the advisory committee members in the second meeting for their review, comments, suggestions and validation. As a check, the next 72 responses were also input into the spreadsheet and summarized to check if there were significant differences when compared with preliminary results. As expected, no significant differences were found in the second set of responses.

The final results of the survey, based on 161 usable responses, were compiled, analyzed and conclusions were drawn. This information together with a refined curriculum was distributed to the steering committee members in the third and final meeting for their input, interpretation and final conclusions.

Developing a Curriculum: With the findings in the second part of this project, a curriculum for Environmental Technology was developed. Tasks and competencies were listed, and were later developed into learning objectives, grouped into logical sets and sequences, and correlated into courses. Descriptions for new courses were developed and courses were sequenced as appropriate. Existing academic

courses and courses in programs such as Chemical Technology were used where necessary or appropriate in the development of the Environmental Technology curriculum. The steering committee was asked in the second meeting for their input in the preliminary determination of major curriculum components, and in the third meeting, the committee reviewed and provided input to a more complete and refined curriculum. Based on this input, minor revisions were made to the curriculum after this meeting and a slightly revised curriculum was circulated by mail to all members for a final review.

Preliminary Findings

In the process of identifying steering (advisory) committee members and determining the general parameters of Environmental Technology, more than thirty environmental professionals were contacted by telephone or visited and interviewed. The first list of names was based on existing contacts with the Chemical Technology program, local regulatory agency referrals and through routine contacts with educational institutions. These initial interviews provided additional names and leads. When names and leads began to be repeated, it became apparent that sufficient names had been gathered for preliminary telephone interviews and for forming a steering committee representing business, industry, education and regulatory agencies.

The telephone interviews were based on four main questions: (1) Is there a need for Laboratory Analysts? (2) What are the broad training requirements? (3) Who are the potential employers of the graduates? (4) Would they serve as steering committee members or recommend someone else?

Several face to face interviews were conducted locally, and detailed interviews were conducted at Phillips 66 Petroleum Co. in Sweeny, Texas. The interviews at Phillips 66 were considerably more detailed relating to knowledge and skills required as well as use of equipment in performing laboratory analysis and environmental sampling.

Information obtained from the interviews was mixed in some respects. Several of the people interviewed indicated that the level of education required for their environmental laboratory in their organization was a B.S. degree in Chemistry. Others indicated an Associate Degree was appropriate for certain positions. Some indicated there was a need for environmental technicians, while others thought that if additional programs in this area were added, saturation of the labor market could occur.

Information from the manufacturing industry indicated a wide variation in the organization of environmental safety and health programs. Except for the chemical

and allied products manufacturing, manufacturers are more likely to have a safety and health department than an environmental or laboratory analysis department. In the chemical plants, production laboratory analysis and environmental analysis are likely to be separate departments. Also in these plants, environmental laboratory analysis and environmental sampling are likely separate departments.

The independent laboratories indicated their need was more specifically tied to laboratory skills in the use of analytical instruments as well as knowledge of EPA methods and State and Federal environmental regulations. The use of laboratories would include the use of gas chromatographs, atomic absorption spectrometers, and other instrumentation.

As the interviews progressed it became apparent that laboratory analysis and environmental sampling were recognizable occupations. It also became apparent that there is considerable variation in the level of education required. In addition, it became apparent that environmental sampling could be included in this study as part of laboratory analysis. The information obtained allowed the project activities to focus in these two areas and to actually consider the present Chemical Technology program as providing a viable basis for the development of a curriculum for environmental technology with emphasis in laboratory analysis and environmental sampling. The Organizations contacted in this initial phase of the project are given in Appendix A.

Steering (Advisory) Committee

With this background, the first meeting of the steering committee was planned. The information gathered to date was organized and used to focus the activities of the project. This information was presented to the committee. This information, together with information and instrumentation obtained from previous reports, was used to prepare the survey instruments for review by the steering committee. An important objective for the first meeting was to seek input and guidance from the steering committee members.

The following was accomplished at the first steering committee meeting:

> Committee members were given a comprehensive orientation to the project, and were presented a comprehensive review of the information gathered from the preliminary interviews and visits.
>
> The committee reviewed in detail the survey to be done by mail and made significant modifications and improvements to the job description. The committee modified and improved seven items, deleted three and added three. The committee also agreed that the title of the program should be

Environmental Technology (Laboratory Analysis and Environmental Sampling).

The steering committee reviewed the competency listing, revised and improved several items and added eight items. The committee reviewed the equipment list and added five instruments.

The committee agreed that: (1) the focus of the project would be on Environmental Laboratory Analysis; (2) Laboratory Analysis would be merged with Environmental Monitoring and Sampling; and (3) Hazardous material handling could be disregarded except for the inclusion of the standard 40-hour course Hazardous Materials Emergency Response and Waste Operations (HAZWOPER).

Following the first advisory committee meeting, the survey instruments were revised based on the input received, and first and second mail outs were done to 781 employers representing independent laboratories and manufacturing laboratories throughout the State. In preparation for the second steering committee meeting, the first 71 responses were compiled with the aid of a Quattro Pro spreadsheet. The information so compiled was used in a preliminary analysis and in determining curriculum blocks. The preliminary results of the survey and preliminary curriculum blocks were presented for review and input in the second steering committee meeting. The minutes of this meeting are given in Appendix B.

The following was accomplished at the second steering committee meeting:

General information, methodology and preliminary results of the mail survey results were presented to the committee. This information, together with the Coordinating Board guidelines for Vocational and Technical programs was presented as a general base for review, discussion and for making curriculum block decisions on a preliminary basis. Matrices of Environmental Technology (Laboratory Analysis and Environmental Sampling) competencies and equipment use versus existing Chemical Technology, General Education and Interdepartmental courses were also presented for discussion and for making curriculum block decisions on a preliminary basis. These matrices showed the competencies that were satisfied or partially satisfied by existing courses. Also presented were Environmental Specific course options, Laboratory Specific course content, and suggested courses categorized into general education, chemical technology, environmental technology and optional courses.

The committee made the following recommendations: That an Environmental Technology Orientation course be included; that Chemical Calculations I not

be included (this recommendation was later reversed); that Unit Operations II and Organic Chemistry II not be included; that Technical and Business Writing not be included, since formal reports are already required in all Chemical Technology courses; that Analytical Chemistry II not be included in order to allow more time for Environmental Technology specific courses; that a Seminar course be included; that driving education not be included; that the ethics competencies should permeate throughout the curriculum. The committee further recommended that regulations and hazardous materials handling be part of each environmental course rather than a separate course. The minutes of this meeting are given in Appendix B.

The following was accomplished in the third steering (advisory) committee meeting:

General information and methodology of the mail survey results were briefly presented to the committee as a refresher. The final results of the mail survey were presented for review and interpretation. Matrices of Environmental Technology (Laboratory Analysis and Environmental Sampling) competencies and equipment use versus Environmental specific courses were also presented for discussion and for making final or near final curriculum decisions. Also presented were, for Environmental Specific courses, theory and laboratory course objectives and tasks.

The committee recommended that the manner of calculating the rank order (the reverse of the way in which the respondents were asked to rank responses) be changed to coincide with the survey instrument to avoid confusion. The committee also made comments and suggestions concerning seven of the new environmental courses under development (please refer to minutes of third meeting in Appendix B). The committee also recommended that a Biology component be included to serve as interface between the living and non-living components of the environment; that the Biology component take the place of Unit Operations I. The committee agreed that Cooperative Education should be an elective and that credit for Co-op could be given in place of the open elective and/or the Environmental Seminar.

Mail Survey Procedure

Survey by Mail: Following the first steering committee meeting, the mail survey instrument, the task listing and the equipment list were revised to reflect all changes agreed upon at the meeting. The following outline summarizes the information, activities and results relating to the mailed survey:

Population Frames: The sources of names and addresses of organizations from

which the sample population was taken were: 1993 Telephone Directories, the 1993 Directory of Texas Manufacturers, the 1993 Rio Grande Valley Manufacturers Directory, the 1993 Rio Grande Valley Maquiladora Directory, and a list of 137 laboratories to be inspected obtained from the Texas Natural Resource Conservation Commission.

Sample Populations: A survey was mailed to each of the following:

All 137 laboratories in List Provided by The Texas Natural Resource Conservation Commission.

All Listed Laboratories in Amarillo, Austin, Corpus Christi, Dallas, El Paso, Houston, San Antonio and Rio Grande Valley.

An Approximate Systematic Sample taken from the 1069 Listed:

Rio Grande Valley Manufacturers	78 (12%)
Rio Grande Valley Maquiladoras	56 (10%)

An Approximate Systematic Sample taken from the 5856 Listed Texas Manufacturers in:

Chemicals and Allied Products	163 (10%)
Electronic and Other Electrical Equip.....	87 (6%)
Paper and Allied Products	27 (5%)
Petroleum Refining and Allied Industries	13 (5%)
Primary Metal Industries	46 (9%)
Rubber and Miscellaneous Plastic Products ..	53 (4%)

The number of surveys mailed was as follows:

Private Laboratories	292
Manufacturers (Outside Area)..	355
Manufacturers (In Area)	134
Total	781

The first mailings were as follows:

To Private Laboratories	October 1
To Manufacturers	October 15

The second mailings were as follows:

To Private Laboratories	October 22
To Manufacturers	November 9

Summary and Conclusions of Survey Results

The survey response data may be summarized as follows:

Number of Surveys Received (See sample population list and annotated respondents in Appendix D.)

Private Laboratories	80	(27%)
Manufacturers (Outside RGV Area)	76	(21%)
Manufacturers (In RGV Area)	21	(16%)
Total	177	(23%)

Number of Surveys Used in Final Results

Private Laboratories	73
Manufacturers (Outside RGV Area) ...	70
Manufacturers (In RGV Area)	18
Total	161

The response rate was close to the 25% anticipated. The break-down into three groups was exploratory and represents a natural division into manufacturing and independent laboratories and a regional subdivision relating to the proximity to the U.S. Mexico border. Twenty six of the surveys returned were not usable simply because the returned surveys were blank - usually with a note indicating the company did not employ personnel in laboratory analysis or environmental sampling.

Highlights of Final Results:

The final results may be highlighted as follows:

Respondents who have Env Techs ...	122 (68%)
No. of Lab. Analysts on Staff	1332
No. of Env. Samplers on Staff	577
No. in Staff Working in Both areas	504
No. of New Lab. Anal. Next 5 Years	568
No. of New Env. Sampl. Next 5 Years .	276
Salary Range, Lab. Anal.....	$ 18,073 to $ 23,263

Salary Range, Env. Sampl..... $ 17,250 to $ 22,235
Interest in Upgrade Training 90 (63%)

As of the time this report is being written, there are no education and training programs in the State specifically for these occupations. It became apparent during site visits, during interviews and in reviewing responses from the mail survey, that in many cases, particularly in the manufacturing sector, entry level environmental positions are filled from within the company with individuals who already have experience within the company. In other cases entry level positions are filled by individuals with a background in chemistry, biology and other related fields.

Among the most important data contained in this summary are employment demand and the job entry salary range. *The final results, on the basis of the 161 usable responses alone, indicate a definite need for technicians in laboratory analysis and environmental sampling over the next five years.* The salary information compares favorably with other technical occupations. If the need for 568 laboratory analysts and 276 environmental samplers (as documented from 161 usable responses representing 23% of those companies surveyed) is generalized to the survey sample of 781 companies, the need translates to 2253 laboratory analysts and 1110 environmental samplers over the next five years. When the generalization is made to the total survey population in the State, the need translates to even larger numbers. These projections are given in Appendix F.

The level of education required to fill job entry is as important as employment demand. *When employers were asked what is the minimum level of formal education for entry-level,* ***two-year technical and community colleges*** *received the greatest number of responses for both laboratory analysis and environmental sampling*. The breakdown and analysis of educational level together with comparison tables and charts are given in Appendix F.

A complete summary of survey results and comparisons by group are given in Appendices C and F. The complete tally of the survey data is given in Appendix G.

Curriculum Design and Documentation

The purpose of the AAS program in Environmental Technology (Laboratory Analysis and Environmental Sampling) is to prepare students in the emerging field of laboratory (environmental) analysis and environmental sampling. The students will be prepared with workplace skills that include chemistry, analytical instrumentation, environmental analysis and procedures, environmental regulations, and quality control/quality assurance.

The curriculum development work for Environmental Technology (Laboratory

Analysis and Environmental Sampling) started with a review of the literature. A partial literature review was done prior to writing the grant proposal for this project. The literature search included the review and use of previous related curriculum development and needs assessment work. The job description and competency listing given in the 1992 TINS report for *Laboratory Analyst/Environmental*, and the survey instrument used by the TSTC system for *Environmental Safety and Health Technology* were both used as a baseline to work from. These documents were reviewed in detail and revised during the first steering committee meeting (see Appendix C).

In the initial phase of conducting a needs assessment more than thirty environmental professionals were contacted by telephone or visited and interviewed. This information together with preliminary survey instruments were presented to and reviewed by the steering committee meeting in the first meeting. The job description, title of program, competencies, equipment use and survey questions were agreed upon prior to the end of the meeting. The job description, one of the items reviewed in depth by the steering committee, is at the heart of curriculum development and reads as follows:

> "The Environmental Technician utilizes knowledge of science, applied technology and QA/QC principles to determine contamination sources and methods of analysis for pollutants in air, water, and soil. Working with an industrial hygienist, engineer and chemist, the Environmental Technician conducts tests for industrial hygiene purposes; analyzes samples of air, soil and water for pollution; and performs field tests according to prescribed methods to determine characteristics or composition of solid, liquid or gaseous materials. Other tasks include writing and interpreting technical reports using knowledge of environmental regulations and hazardous waste management standards."

Following this first meeting of the steering committee, the survey instruments were printed in final form and 781 surveys were mailed to independent laboratories and manufacturers throughout the state.

Tentative decisions on curriculum blocks were made based on a summary of the first 71 responses of the mail survey, and the input of steering committee members in the second steering committee meeting. To aid the curriculum decision making process, matrices were developed depicting courses *vs.* competencies, courses *vs.* equipment use, courses *vs.* areas of environmental concern and courses *vs.* pressing (training) needs. The first set of matrices was designed to determine in which existing courses environmental training needs were already being addressed or partially addressed. The second set of matrices was designed to determine in what new courses the unmet environmental training needs would be addressed. A

preliminary curriculum was tentatively agreed upon at the end of the second steering committee meeting. With this information, outlines and instructional objectives would be written for each course and a refined curriculum would be developed.

With the final results and the final ranking of competencies and other training needs (there was no significant difference in ranking between the preliminary and final results), the development of detailed components of the curriculum was undertaken. See Appendix C. This curriculum work in preparation for a third steering committee meeting included the development of outlines, instructional objectives and descriptions for each new course tentatively agreed upon at the second steering committee meeting. In this process, steering committee members were consulted or kept informed by telephone and by FAX.

The refined curriculum and the documentation leading to it were next taken to the third and final steering committee meeting for review. The committee made several suggestions. These recommendations are documented in the Steering Committee section of this report and in Appendix B. The recommendations of the steering committee were incorporated into the curriculum.

Texas State Technical College is on the Quarter System. As a consequence, all course level curriculum work was first organized in this system. The Quarter System curriculum was completed in final form and submitted to the Coordinating Board for approval in April. The final curriculum in the Quarter format was then converted to the Semester system. Except for the Environmental Seminar, all curriculum components were carried over to the Semester format. The total contact hours for the Quarter and Semester curriculums are 1992 and 1680 respectively. There is concern that the loss in total contact hours in the conversion to the semester system may cause hardship on the program staff and on the students. The curriculum in the Quarter and Semester format are given in Appendix E. Also in Appendix E are the course descriptions, course objectives and course matrices.

ENVIRONMENTAL TECHNOLOGY
(Laboratory Analysis and Environmental Sampling)

APPENDIX A

Interview Summary Report in Initial Phase of Project

BEST COPY AVAILABLE

Environmental Safety and Health Technology
Progress Report

Advisory Committee Meeting - August

TELEPHONE INTERVIEWS / PERSONAL INTERVIEWS SUBDIVIDED IN FOUR CATEGORIES

1. EDUCATIONAL INSTITUTIONS

   A. Laredo Jr. College
   B. TSTC - Waco
   C. Partnership for Environmental Technology - California
   D. California Community College
   E. San Jacinto College, Houston
   F. Amarillo College, Amarillo

   Summary of Comments:

   A. Possibility of Overflooding the (OSHA + HMAT) Market.
   B. Two Year Educational Program not needed, work can be done by aspiring Medical School candidates waiting to be accepted are presently working as Environmental Technicians.
   C. Solid Waste & Hazardous Materials Training is needed.

2. REGULATORY AGENCIES

   A. Texas Air Control Board, Harlingen
   B. Texas Water Commission (Now Texas Natural Resources Conservation Commission)
   C. Environmental Protection Agency, Dallas

   Summary of Comments:

   A. The curriculum should include EPA approved Laboratory Standard Operating Procedures, Sampling Protocol, and Water Analysis Procedures.
   B. Presently, regulatory agencies hire and employ only B.S. Chemists to work in their environmental laboratories.
   C. The environmental technician should have training in Hazardous Waste & Materials, and Water Analysis.

3. INDEPENDENT ORGANIZATIONS / LABORATORIES

   A. MLT International Co., Harlingen
   B. Deltronicos, Matamoros
   C. Environmental Resources Committee, Harlingen

E. Pan American Laboratories, Brownsville
F. Texas Innovation Network, Dallas
G. DIASA, Matamoros
H. Ambiotech, Harlingen

Summary of Comments:

A. The environmental technician should excel in laboratory analytical skills as well as industry specific skills.
B. It is important to prioritize emerging technologies.
C. The environmental technician should be proficient in Chemistry, the use of analytical instruments, environmental regulations, and in the analysis of air, water, and solid waste samples.
D. The environmental technician should be able to use the Gas Chromatograph, Atomic Absorption Spectrophotometer, as well as having knowledge and performance skills of the EPA 600 series procedures.
E. The environmental technician could be required to be the Hazardous Materials Coordinator, Compliance Analyst, or the environmental sampler.

4. INDUSTRIAL / MANUFACTURING

A. Kemet Electronics, Matamoros
B. Trico Technologies, Harlingen
C. Amarillo Gear Company, Amarillo
D. ARCO Chemical Company, Houston
E. Solvay Polymers, Inc.
F. Fruit of the Loom, Harlingen
G. USPCI, San Antonio
H. Phillips Petroleum Company, Sweeney
I. Celanese Chemical Company, Bishop

Summary of Comments:

A. At present most of the environmental technicians are college graduates, but two year college graduates could possibly perform these same tasks.
B. The existing Chemical Technology program graduates qualify to perform environmental laboratory analysis.
C. The environmental technicians primarily perform monitoring and sampling.
D. The environmental technicians should be trained in water analysis, chain-of-custody, and wastewater treatment.
E. There exists a need to have environmental technicians that are familiar or knowledgeable in Hazardous Occupational Safety, Evidence Analysis, and EPA protocol.

ENVIRONMENTAL TECHNOLOGY
(Laboratory Analysis and Environmental Sampling)

APPENDIX B

1. Steering Committee Membership
2. Agenda for Meetings
3. Minutes of Steering Committee Meetings

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TEXAS STATE TECHNICAL COLLEGE - HARLINGEN
ENVIRONMENTAL TECHNOLOGY PROJECT
STEERING COMMITTEE MEMBERS

Mr. Cliff Fullingim
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Dr. James Earhart, Ph.D.
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Oscar Ramirez, Jr. Ph.D.,
US - Mexico Border Coordinator
Environmental Protection Agency
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Mr. John Sturgis, District Manager
Texas Natural Resources Conservation Commission
813 East Pike Blvd.
Weslaco, TX 78596-4935
(210) 968-3165

TEXAS STATE TECHNICAL COLLEGE HARLINGEN

Steering Committee Meeting for
Environmental Safety and Health Technology

Short Course Center Conference Room
Friday August 27, 1993, 10:00 A.M.

AGENDA

I.	10:00 - 10:10	Welcome J. Gilbert Leal, PhD, President
II.	10:10 - 10:20	Introductions and Overview of Programs and Program Development George McShan, Dean of Instruction
III.	10:20 - 10:50	Background Information and Orientation to Project Oscar Hinojosa and Al Guillen
IV.	10:50 - 11:20	Open Discussion
V.	11:20 - 4:00	Work Session
	12:00 - 12:30	Review Information Gathering Instruments (Working Lunch)
		Identify/Revise Duties, Skills and Knowledge Requirements
VI.	4:00 - 4:10	Election of Committee Chair and Co-Chair
VII.	4:10 - 4:15	Plan for Next Meeting

MINUTES
ENVIRONMENTAL ADVISORY COMMITTEE MEETING

AUGUST 27, 1993

MEMBERS PRESENT:

Cliff Fullingim	Phillips 66 Petroleum Company
Shirley Hammond	ARCO Chemical Company
William Lipps	Pan American Laboratory
Carlos Marin, Ph.D.	Ambiotec Environmental Consultants
Ruben Gonzales	Phillips 66 Petroleum Company
Daryl Knowles	TSTC Waco
Tom Malloy	Shell Development Company
John Sturgis	Texas Water Commission
Oscar Ramirez, Ph.D.	Environmental Protection Agency

SUBSTITUTES:

James Earhart and James McCarry for Ann Puig.	Laredo Junior College

TSTC REPRESENTATIVES:

J. Gilbert Leal	President, TSTC-Harlingen
George McShan	Dean of Instruction
Oscar V. Hinojosa	Grant Project Director
Alfonso Guillen	Chair - Chemical Technology
Elaine L. Flores	Senior Secretary
Rosa Ochoa	Secretary
Marizel Gutierrez	Secretary

A thirty minute registration and introduction session preceded the meeting.

Mr. Oscar Hinojosa opened the meeting and introduced Dr. J. Gilbert Leal, President of Texas State Technical College - Harlingen, Dr. Leal welcomed the committee to the campus stating that their presence was greatly needed and appreciated. Mr. George McShan, Dean of Instruction, was introduced and spoke on the State-of-the-College. He explained the process of program development and emphasized the purpose of the committee. He explained that the mission of the College was state-wide. He asked each individual present to introduce themselves, the company they represented, and their job title.

BACKGROUND INFORMATION AND ORIENTATION TO PROJECT

Mr. Hinojosa spoke to the committee presenting background about the reason for this curriculum project for Environmental Safety and Health Technology. He mentioned that environmental concerns state-wide were the principle reason for TSTC Harlingen to get involved. Mr. Hinojosa stated that NAFTA, Industry, and the Higher Education Coordinating Board had identified environmental concerns as a priority in Texas. Mr. Hinojosa further stated that TSTC had applied for a Grant to develop a curriculum in Environmental Technology due to the identification of Laboratory Analysts as an emerging technology.

Mr. Hinojosa stated that input and support from Industry was essential and necessary in order to comply with the project's requirements. He said that the committee's presence was evidence of that support. Mr. Hinojosa then presented a sequence of events that led to this Advisory Committee meeting. He mentioned that the initial preparation, research, telephone inquiries, interviews, and personal visits took approximately two months. This preparation was necessary just to get a sense of the environmental interest across the various agencies in Texas and to organize this advisory committee. Mr. Hinojosa explained the Advisory Committee's functions and responsibilities as being the following.

(1) Provide technical expertise relating to needs assessment, labor market demand, and task inventories.
(2) Provide expert judgment and feedback in the evaluation of each part of the project.
(3) Review and validate the results, findings and conclusions of this project.

He added that at this meeting the Advisory Committee would provide assistance in the development of a job description, survey instruments, duties and task listing relative to the training intended. He mentioned that California was leading the way in research in the area of Hazardous Materials Technology.

Mr. Hinojosa provided a brief review of two related studies: (1) a national survey to determine the needs for Hazardous Materials Technicians and Related Workers, and (2) a state-wide survey conducted by the TSTC system's research department located in Waco. He mentioned our survey would be conducted to obtain more specific information concerning the market need for environmental laboratory analysts and the nature of training they should have upon graduation from an Associate Degree program. He added that he expected that the response to the survey would be twenty five-percent as opposed to eight percent that the system received in TSTC's previous survey. He stated that the TSTC system's survey had shown that the hourly wage range was between $9.00 and $12.00 per hour. Mr. Hinojosa introduced Mr. Al Guillen, chairman of the Chemical Technology Program and subject matter specialist in this project.

Mr. Guillen told the committee that copies of all transparencies shown could be found in each of their packets. He mentioned that during the previous two months Mr. Hinojosa and he had worked diligently to prepare for the meeting. He stated that many telephone calls

had been made to experts in the environmental discipline throughout a variety of agencies. He said that they had spoken to experts from four main groups: those groups being environmental concern groups, educational institutions, regulatory agencies, and the manufacturing industry throughout Texas. He indicated that there was a need to obtain expert information from all facets of the environmental spectrum in order to create a curriculum that would prepare a technician who would be marketable. He emphasized that it was essential to diversify the technician so as to afford that individual the best opportunity to obtain a meaningful job upon completion of his or her education. He said that the Texas State technical College System had Chemical Technology Programs in four campuses throughout the State and that each of the programs was producing a generic chemical technician who could work in any type of laboratory requiring a chemical technician with training in Gas Chromatography, Atomic Absorption, UV/VIS Spectroscopy, etc.

Mr. Guillen presented the committee with information that he and Mr. Hinojosa had acquired through telephone interviews, personal interviews, and a visit to Phillips 66 Refining Company's environmental laboratories and environmental division. He stated that one educator indicated that the environmental laboratory technician positions are generally filled by Medical Students while waiting to be accepted to Medical School. Another educator expressed concern that if too many programs were preparing environmental technicians, a saturation of the market might occur. Others indicated that it was necessary that more two-year educational institutions develop environmental programs. Mr. Guillen further mentioned that the regulatory agencies indicated that they presently hired only B.S. Chemists for environmental analysis but expressed a need in hazardous waste materials and water testing. The independent laboratories indicated that their need was more specifically tied to laboratory skills in the use of analytical instruments such as knowledge of EPA methods, the use of gas chromatographs, atomic absorption spectrophotometers, and other instrumentation. Mr. Guillen explained to the committee that the existing Chemical Technology Program already taught some of those tasks and skills to a point that the program could provide a core of the educational need if indeed the committee agreed that the curriculum should be one for the training of Environmental Laboratory Technicians. Mr. Guillen stated that he and Mr. Hinojosa had been discussing the possibility of educating a viable, marketable, environmental technician knowledgeable in environmental procedures, analytical instruments, with a strong Chemistry background as well as training in sampling, monitoring, and perhaps regulations in order to develop the desired diversity.

Mr. Guillen stated that the telephone interview had provided Mr. Hinojosa and him with the awareness that each of the industrial facilities had different organizational structure in how they approached their environmental responsibilities and duties. He mentioned that some had separate entities in the sampling and monitoring from the analytical laboratories, while others had a singular divisional structure. He stated that some sent all their samples to independent laboratories for analysis while others analyzed their own samples.

OPEN DISCUSSION

Mr. Guillen asked the committee to respond to what they had heard and to please feel free to express their beliefs concerning what direction the project should take in the development of the environmental training curriculum to be created. Each committee member responded agreeing that an environmental technician training curriculum was necessary but that each had a different view concerning which direction the project should take given their diverse backgrounds and needs. Some indicated a preference in sampling while others indicated a preference for laboratory analysis with strong Chemistry backgrounds. The conclusion of the discussion was agreement by the committee that the proposed curriculum should focus on Environmental Laboratory Analysis and should include Environmental Monitoring and Sampling.

After listening to the committee's response Mr. Guillen explained the core general education requirements established by the Southern Association of Colleges and Schools. Upon explaining the requirement of the fifteen semester hours of general education, he suggested that perhaps what was needed was an option to the existing Chemical Technology Program and asked if they agreed. The committee responded and stressed the need for the Chemistry background and knowledge of EPA protocol as well as knowledge in the use of analytical instrumentation. One committee member suggested replacing the polymer courses of the existing Chemical Technology Program with those courses specific to the environmental technician. Much dialogue occurred from each of the committee members and in the end the group agreed to look at these considerations after more data are gathered.

Mr. Guillen mentioned that the committee would have a working lunch at which time each of the members would complete two survey questionnaires and critique the instruments upon completion of the surveys. He mentioned that one of the surveys being completed would be mailed, after review by this committee, to approximately one thousand potential employers that had been identified as involved with environmental laboratory analysis and sampling in Texas.

REVIEW OF INFORMATION GATHERING INSTRUMENTS

After the lunch session the committee decided to clarify the title of the technician to be trained and was asked to create a realistic job description. After discussion and dialogue, the title for the technician to be trained was agreed upon and it would be ENVIRONMENTAL TECHNICIAN (Laboratory Analysis and Environmental Sampling). Mr. Hinojosa proceeded to lead the discussion and record the suggestions, additions and deletions during the review of the survey instrument.

The first item in this survey was the job description. The job description was discussed at length and revised, sentence by sentence. The following became the final product of the committee's work.

The Environmental Technician utilizes knowledge of science, applied technology, and QA/QC principles to determine contamination sources and methods of analysis for pollutants in air, water, and soil. Working with an industrial hygienist, engineer and chemist, the environmental Technician conducts tests for industrial hygiene purposes; analyzes samples of air, soil, and water for pollution; and performs field tests according to prescribed methods to determine characteristics or composition of solid, liquid or gaseous materials. Other tasks include writing and interpreting technical reports using knowledge of environmental regulations and hazardous waste management standards.

Items in the proposed mail-out survey were critiqued by the committee, item by item, and changes were made that improved items 2, 3, 7, 9, 10, 11, and 13. Item 8 was deleted. In item 2, job related responsibilities, QA/QC, ethical and legal responsibilities and analytical chemistry were added, and basic science, current information and technical knowledge were deleted. The committee felt that the responses for items 2 and 3 should be ranked. Other changes to the survey were to change all references to the title to read only words consistent with Environmental Technician (Laboratory Analyst and Environmental Sampling).

Next, the committee was asked to review the duty and task listing. The committee discussed whether or not biological analysis would be considered part of the studies for the proposed technicians. It was agreed that biotechnology was an emerging technology and might be considered at a later date. The committee began to discuss a variety of duties that they believed the technicians should possess at the completion of their education. High on the priority was the ability to communicate effectively in writing and orally. Another important area of knowledge that the committee brought up was the knowledge and awareness of the importance of Job Safety, Quality Assurance and Quality Control requirements and responsibilities, maintenance of records from collection to disposal of sample. Mr. Guillen and Mr. Hinojosa led the committee through a list of general duties that were to be sent out on the mail-out survey for the committee's consideration and approval. The committee members were asked to voice their opinion to delete or add any duties they believed should be on the list or not. Several additional duties were suggested and were added to the list. A copy of the list of duties is available in the transcription of the meeting and in the final mail-out survey.

The mail surveys and an equipment use list that were completed by each member were collected. Any additional equipment items contained in the completed list of equipment will be added to the original list to arrive at the final equipment list. This final list will be included in the mail survey.

A second survey instrument to be conducted in person during the various visits that Mr. Guillen and Mr. Hinojosa will make was distributed to each of the members. The committee agreed to complete a review of the instrument and return the instrument to Mr. Hinojosa within a couple of weeks.

ELECTION OF CHAIR AND CO-CHAIR

Election of Chair and Co-Chair for the Environmental Technology Steering Committee was the last item on the agenda. Mr. Hinojosa explained that all the administrative work would be handled by himself and Mr. Guillen, with the help of the secretarial staff. Mr. Daryl Knowles was nominated and a second was made. The committee then voted, and Mr. Knowles was elected Chairman. Nominations for Co-Chair were opened. The committee agreed that Mr. Gonzalez would serve as Co-Chairman.

PLAN FOR NEXT MEETING

A meeting date for the second of three Steering Committee meetings was selected and that date is December 3, 1993. The committee will meet at the Short Course Center conference room at Texas State Technical College- Harlingen.

Mr. Hinojosa thanked all the committee members for their assistance and stated that the minutes would be forthcoming. The meeting was adjourned.

TEXAS STATE TECHNICAL COLLEGE HARLINGEN

Second Steering Committee Meeting for
Environmental Safety and Health Technology

Conference Center* Conference Room
Friday December 3, 1993, 10:00 A.M.

AGENDA

10:00 - 10:10	I.	Welcome and Introductions George H. McShan
10:10 - 10:50	II.	Update of Project Activities and Review of Preliminary Results Oscar Hinojosa and Al Guillen
10:50 - 11:20	III.	Open Discussion and Interpretation of Preliminary Results
11:20 - 2:55	IV.	Work Session Review of Preliminary Curriculum 12:00 - 12:30 (Working Lunch) Review, Revise, Comment and/or Suggest Curriculum Components based on Findings and Interpretations
2:55 - 3:00	V.	Plan for Next Meeting

*Previously called Short Course Center

MINUTES
ENVIRONMENTAL ADVISORY COMMITTEE MEETING

DECEMBER 3, 1993
10:00 A.M.

MEMBERS PRESENT:

William Lipps	Pan American Laboratories
Oscar Ramirez	EPA U.S./Mexico Border Coordinator
Ruben Gonzalez	Phillips 66 Company
John Sturgis	TNRCC
Tom Malloy	Shell Development Company
Cliff Fullingim	Phillips 66 Company
Shirley Hammond	ARCO Chemical Company
Ron Popp	USPCI
James Earhart	Laredo Junior College

SUBSTITUTES:

David Hanawa for Carlos Marin	Ambiotec Environmental

TSTC REPRESENTATIVES:

Steven Vassberg	Associate Dean
Oscar Hinojosa	Grant Project Director
Alfonso Guillen, Jr.	Chair - Chemical Technology
Marizel Gutierrez	Project Secretary

A thirty minute registration and introduction session preceded the meeting.

Mr. Steven Vassberg, Associate Dean of Economic Development and Industrial Training, welcomed the committee on behalf of Dr. J. Gilbert Leal. He emphasized the importance of their contributions to the curriculum development project for Environmental Technology (Laboratory Analysis and Environmental Sampling). He asked that each committee member introduce himself/herself and the company they represented and thanked them for their participation.

Mr. Ruben Gonzalez, Steering Committee Co-Chair, presided over the meeting. He asked that the committee consider approval of the minutes for the meeting held on August 27, 1993. The minutes were approved as written.

Mr. Gonzalez asked Mr. Oscar Hinojosa to proceed with his presentation, Update of Project Activities.

Mr. Hinojosa stated that he would provide some background information on the work that had been done and presented some general information about the requirements for curricula as well as some preliminary results of the survey conducted. He mentioned that Mr. Guillen would review those results that dealt more closely with the curriculum. He mentioned that each of the committee member's packets had a handout of the transparencies to be discussed.

Mr. Hinojosa said the survey was sent to individuals and agencies identified from a variety of sources. He listed the following sources as the mailing list.

1993 Telephone Directories from the major communities in Texas.
1993 Directory of Texas Manufacturers and the Rio Grande Valley.
1993 Maquiladora Directory.
A list of Laboratories provided by the Texas Natural Resources Conservation Commission.

He mentioned that all listed laboratories in Amarillo, Austin, Corpus Christi, Dallas, El Paso, Houston, San Antonio, and the Rio Grande Valley were surveyed. He stated that an approximate systematic sampling of the 1,069 listed facilities in the Rio Grade Valley was carried out including 78 (12%) of the RGV Manufacturers and 56 (10%) of the RGV Maquiladoras. Mr. Hinojosa stated that an additional sampling of 5,856 manufacturers was done including the following:

163	Chemicals and Applied Products
87	Electronic and Other Electrical Equipment
27	Paper and Allied Products
13	Petroleum Refining and Allied Industries
46	Primary Metal Industries
53	Rubber and Miscellaneous Products

Mr. Hinojosa said that the surveys were categorized into three groups, Private Laboratories, Manufacturers (Outside the RGV) and Manufacturers (Inside the RGV). He said the total number of surveys sent was 781, adding that two mailings had been sent out with a follow-up mailing to those that did not respond to the first mailing. He said that surveys continued to arrive a few each day, stating that the preliminary information that Mr. Guillen would present was based on the first 71 surveys received. He indicated that an analysis was done on an additional 72 surveys received and that no significant difference was seen to refute the preliminary findings.

Mr. Hinojosa said that as of December 2, 1993, he had received 151 responses to the survey, approximately 19% of the two mailouts. He anticipated that the project would receive a 20% return of the 781 survey forms sent out. He explained how the data was entered into computer for analysis and how the tallies were made. Mr. Hinojosa mentioned that there were several highlights from the preliminary results and presented and overview of the survey instrument with the average ranking filled in on each blank of the instrument. He explained each item of the survey and emphasized that 60 of the 71 survey respondents indicated they employed environmental laboratory analysts or

environmental samplers. He provided the number of laboratory analysts, environmental samplers, and combined area technicians presently employed by the 71 respondents. He said that the respondents indicated that there were 691 lab analysts, 262 environmental samplers, and 196 technicians working in both areas presently employed. He said that there was definitely a need for the continuance of the project based on the fact that there was an estimated need of 256 Laboratory Analysts and 136 Environmental Samplers over the next five years.

Concerning the minimum educational requirements anticipated by the respondents, 17 indicated that four years of college were required, 28 indicated that a two-year degree was required, and 15 indicated that a high school diploma was necessary for entry level as a Laboratory Analyst. Eleven respondents indicated that a four-year degree was necessary for an environmental sampler while 26 indicated that a two-year degree would be required and 19 indicated that a high school education was necessary for an entry level environmental sampler.

Mr. Hinojosa stated that the average salary range for a Laboratory Analyst was $17,914 to $22,779, while the average range for the Environmental Sampler was $16,796 to $22,038.

Mr. Guillen commented that he had attended a planning workshop in Houston on November 29th and 30th hosted by the American Chemical Society (ACS). The objective was to standardize curricula and instruction at the two-year level across the United States in the area of Chemical Technology to include Environmental Technology. He said that the intent was to create a highly trained, well diversied technician. He added that industry was looking to increase the educational requirements for their Chemical Technicians and would also reduce the number of full-time permanent hires, opting instead, to hire technicians from contracting agencies.

Mr. Sturgis asked for an explanation to the ranking averages shown on the survey instrument since the instructions for completion were counter what shown as average responses. Mr. Hinojosa explained that in order to show a value that was more acceptable for greater concern the ranking values had been revised. He said that every ranking of 3 was changed to a 1 and every ranking of 1 was changed to a 3. This change generated the higher number representing a greater concern rather than the opposite. The final ranking shown on the survey instrument used a set of values where the higher the number the more important the concern.

Mr. Hinojosa introduced the subject of curricula and general curriculum requirements. He mentioned that the typical Associates of Applied Science Degree, AAS, is limited to 108 Quarter Hours, and that a Certificate curriculum is limited to 90 Quarter Hours. He spoke of a new initiative that includes a partnership between the High Schools and institutions of higher learning called TECH PREP. The Tech Prep curriculum is limited to 126 Quarter Hours allowing the student to earn one Quarter's worth of credit while at the High School and then adding a quarter and offering advanced technology courses at the college. The TECH PREP Associates Degree is an advanced technology degree.

Mr. Hinojosa informed the committee that the typical AAS program required the student to attend lecture and laboratory for approximately 28 hours per week, while the certificate curricula required a student to attend approximately 30 hours per week.

Mr. Hinojosa advised the committee that there existed a minimum requirement of general education courses an AAS curriculum should have. He said that the requirement was established by the Southern Association of Colleges and Schools (SACS) a body that accredits two and four year colleges. The minimum requirement is a total of 15 Semester Hours including the following course:

Humanities & Fine Arts (Engl 1301 Required) (Oral Communications Required)	6 Semester Hours
Social & Behavioral Sciences (No Designated Course Required)	3 Semester Hours
Natural Sciences and Mathematics (No Designated Course Required)	3 Semester Hours
General Education Electives (Any Course Meeting General Ed. Requirements)	3 Semester Hours
Total General Education Electives	15 Semester Hours

Mr. Hinojosa added that SACS required that a curriculum should include a Computer Literacy Course and an outside or non-major elective.

A new national initiative in education is called SCANS (The Secretary's Commission on Acheiving Necessary Skills). SCANS includes the list of competencies below.

RESOURCES	Identifies, organizes, plans, and allocates resources such as TIME, MONEY, MATERIAL & FACILITIES, and HUMAN RESOURCES.
INTERPERSONAL	Works with others. Participates as a member of a team, teaches others new skills, serves clients/customers, exercises leadership, negotiates, and works with diversity.
INFORMATION	Acquires and uses information. Acquires and evaluates information, organizes and maintains information, Interprets and communicates information, Uses computers to process information.

SYSTEMS ----------	Understands complex inter-relations. Understands systems, monitors and corrects performances, and improves or designs systems.
TECHNOLOGY ----------	Works with a variety of technologies. Selects Technology, Applies technology to tasks, Maintains and troubleshoots equipment.

Al Guillen informed the committee that this topic was discussed at the ACS meeting held at Houston on November 30th. He stated that there was a national awareness concerning the lack of ethics, responsibility, and accountability exhibited by college graduates from all colleges and universities. He stated that the industry representatives present at the ACS meeting had stated they wanted that attitude changed at the educational institutions. Dr. Earhart mentioned that it occurred in academia and several committee members stated they had observed that on an increasing basis. Mr. Guillen stated that due to the greater requirements necessary to comply with ISO 9000 and Quality Assurance and Quality Control, it was essential that students emerging from a training program realize the degree of responsibility and accountability they will have at entry level.

Mr. Ruben Gonzalez asked Mr. Guillen to present the next topic on the Agenda Review of Preliminary Results.

Mr. Guillen informed the committee about a set of documents in each of their packets including a coy of each transparency to be used. He addressed their attention to the completed survey instrument and the two support documents which showed the ranking for competencies and equipment. He explained that a matrix had been developed comparing the ranked competencies in descending order versus the general education courses presently taught at TSTC. The intent of this comparison was to determine how much support and how many competencies would be satisfied by those courses. He said that all outcomes and recommendations that were to be made to Texas Higher Education Coordinating Board would be based on the information acquired from the surveys and the recommendations made by the Steering Committee.

The matrix comparison of competencies versus the general education and interdepartmental courses showed that the courses that provided either partial or full instruction for the competencies were the following:

ENGL 1301	Composition I
MATH 1314	College Algebra
ENGL 1302	Composition II

MATH 1342 Statistics
IMT - 1013 Introduction to Computers

Mr. Guillen stated that he had prepared the same type of matrix comparing the competencies versus the existing Chemical Technology Courses. He said that most of the competencies were included in the existing syllabi but that eight competencies were not addressed by either the general education or the Chemical Technology course offerings. The following competencies were either not satisfied or partially satisfied by the existing Chemical Technology Courses.

(a) Analyze Samples in Accordance with Regulations.
(b) Prepare Sample Containers.
(c) Perform Sampling Tasks from Collection to Disposal.
(d) Present and Defend Analytical Data.
(e) Maintain Inventory of Chemicals and Reagents.
(f) Drive Safely.
(g) Train Employees.
(h) Read Flow Sheets.
(i) Arrange Contract Services.

Mr. Guillen stated that the same type of matrix comparison was done for the equipment identified as necessary for mastery by the entry level technician. He indicated that the following items of equipment were not available and or presently taught at TSTC. this determination was made by comparing the equipment list recommended by the surveyed individuals and the existing equipment students are presently instructed on as part of their Chemical Technology training at Texas State Technical College.

(a) Sampling Equipment.
(b) DO Meters (Dissolved Oxygen)
(c) TOC (Total Organic Carbon)
(d) Purge & Trap Sampling for Chromatography.
(e) Extractors (TCLP).
(f) Automatic Samplers.
(g) Inductively Coupled Plasma Spectroscopy (ICP).
(h) Centrifuge.
(i) Total Organic Halogen (TOH) Analyzer.
(j) Kadurna-Danish Evaporators.
(k) Ion Chromatographs.
(l) Photovac Portable P.I.D.
(m) Portable OVA-108 Gas Chromatograph.
(n) Gel Permeation.

Mr. Guillen addressed item 2 of the survey instrument, Areas of Greatest Environmental Concern. He mentioned that this item required that he and Mr. Hinojosa focus on those

specific areas affecting the environment which the survey indicated. He said that a matrix had been made comparing the areas of greatest concern to the existing Chemical Technology courses and that the following areas were not addressed at all and would require either course development or incorporation of competencies into existing courses.

(a) Hazardous Materials.
(b) Air Quality.
(c) Solid Waste.
(d) Occupational Safety.
(e) Environmental Policy.
(f) Water Management.
(g) Permitting.
(h) Sanitation/Environmental.
(i) Emergency Response.
(j) Asbestos.
(k) Land Use Policy.
(l) Energy.
(m) Pest Control.

Mr. Guillen stated that another matrix was made comparing those items in item 3 of the survey instrument, Most Pressing Needs. All items were either partially or fully supported by the existing Chemical Technology Courses. The following items were not supported by the General Education courses and must be addressed by the proposed curriculum.

(a) Knowledge of regulations.
(b) Organic & Analytical Chemistry.
(c) Ethical/Legal Responsibility.
(d) Organizational Skills.

Mr. Guillen stated that the Chemical Technology program reinforced what was taught in English courses and the Introduction to Computers course by requiring their students to utilize computers in writing formal reports for each laboratory experiment from the fourth quarter on. He handed out some examples of the reports for the committee to evaluate and said that some quarters, students had as many as three reports to turn in each week. The committee was pleased to see the quality of work the students submitted and indicated some concern about the amount of time required to prepare the reports.

Mr. Guillen summarized his presentation and review with the committee the requirement established by the Southern Association of Colleges and Schools for general education courses. He said that based on the SACS requirements and the matrixes prepared the following courses were the ones necessary to meet the minimum of 15 Semester Credit Hours.

Hours		Semester Credit
1. ENGL - 1302	Composition I	3 Hrs.
2. SPCH - 1311	Intro. to Speech	3 Hrs.
3. MATH - 1314	College Algebra	3 Hrs.
4. PSYC - 2301	General Psychology	3 Hrs.
5. General Education Elective (Non-Program Course)		3 Hrs.

Mr. Guillen then presented a list of eight competencies and the general education courses that were required to support them. He then asked the committee to tell him which courses in addition to the courses listed above they wished the curriculum to include. The committee asked that he continue with his presentation and a determination would be made after they had more information from which to base a decision from. Mr. Guillen provided the committee with a list of all the general education courses offered by TSTC.

Mr. Guillen then told the committee that the curriculum was limited to 108 quarter hours by the Texas Higher Education Coordinating Board. He stated that the more hours taken up by general education courses the fewer hours would be available for environmentally specific courses. He mentioned that the existing Chemical Technology curriculum required 8 general education courses. He then suggested a list of general education courses considered necessary to provide sufficient background to the technician graduate. The following is the list of courses he suggested based on the matrix comparisons of suvey results.

1. ENGL - 1301	Composition I	3 Hrs.
2. SPCH - 1311	Introduction to Speech	3 Hrs.
3. ENGL - 2314	Technical/Business Writing I	3 Hrs.
4. MATH - 1314	College Algebra	3 Hrs.
5. PSYC - 2301	General Psychology	3 Hrs.
6. MATH - 1342	Statistics	3 Hrs.
7. General education Elective		

Additionally a support course was recommended:

IMT - 1013	Intro. to Computers	3 Hrs.

A total of 21 semester hours in general education and support courses would complement the curriculum if the suggested courses listed above were accepted by the committee. Mr. Guillen also offered as optional courses to consider the following list to the committee.

1. SPCH - 1318	Interpersonal Communication	3 Hrs.
2. ENGL - 2315	Technical/Business Writing II	3 Hrs.

The committee did not wish to include the options suggested and decided against including ENGL - 2314, Technical/Business Writing I, based on the formal reports that will be required in the Chemistry and Environmental courses. This then provided for a total of 21 semester hours of General Education courses to be included in the curriculum.

Mr. Guillen then suggested the following list of existing Chemical Technology courses as a core for the Environmental Technology (Laboratory Analysis & Environmental Sampling) curriculum.

1.	CHT - 120	General Chemistry I	5 Hrs.
2.	CHT - 124	General Chemistry II	5 Hrs.
3.	CHT - 202	Organic Chemisty I	4 Hrs.
4.	CHT - 206	Analytical Chemistry I (Gravimetric)	4 Hrs.
5.	CHT - 207	Analytical Chemistry II (Volumetric)	5 Hrs.
6.	CHT - 208	Organic Chemistry II	5 Hrs.
7.	CHT - 210	Analytical Instruments I	4 Hrs.
8.	CHT - 302	Analytical Instruments II	4 Hrs.
9.	CHT - 304	Unit Operations I	5 Hrs.
10.	CHT - 308	Analytical Instruments III	4 Hrs.

Mr. Guillen presented the committee with three other course options to consider, CHT - 122 Chemical Calculations I, CHT - 310 Unit Operations II, and an environmentally specific orientation course.

The committe asked that an Environmental Technology Orientation course should be included. The other two courses were rejected and upon further discussion it was agreed that CHT - 208, Organic Chemistry II, was not necessary either. The committee agreed that the remaining Chemical Technology courses should be included in the curriculum. This block of courses would constitute 40 quarter hours. The combined general education courses and Chemical Technology courses would include a total of 61 hours toward the 108 maximum. Mr. Guillen asked the committee to clarify whether they wished the graduating technician to take a Defensive Driving Course as part of the course study or did they wish the technician to have a clean driving record. Mr. Sturgis stated that his office required that all new hires must have proof of insurability.

The committee asked Mr. Guillen if he had a worked out sample curriculum by quarters. He responded that he did and presented a six quarter curriculum which he had provided the committee in their packets.

Mr. Fullingim asked if all the courses already itemized on the proposed curriculum had to be taught. Mr. Guillen responded that they did not and asked the committee to feel free to comment on which courses they wished to delete or add to the curriculum. (See

Proposed Curriculum attached. Note: The proposed curriculum is a product of the survey results.)

The committee again recommended that Organic II, Technical/Business Writing, Analytical Chemistry II be deleted from the curriculum to allow more time for Environmental specific courses. A suggestion was made that students take Spanish in response to international demands that may occur in the future due to NAFTA environmental requirements and opportunities. The committee agreed that the requirement for written formal reports for experimentation conducted the last three quarters would satisfy the technical report writing competency and should be listed as an objective for each of the Chemistry and Environmental courses.

Dr. Ramirez asked if a Seminar Program existed where special topics might be covered that would not require a course to be developed. Mr. Guillen answered that Seminar did not exist. Mr. Sturgis stated that Seminar was a great idea for topics such as sexual harassment and other specialty topics. Mr. Fullingim suggested that some of this could be offered in a specialized orientation course. Mr. Guillen stated that he would work to develop a Seminar process. Mr. Sturgis indicated that time management, safety, and drug abuse could also be discussed.

Dr. Earhart stated that the ethics question should permeate throughout the curriculum. Mr. Sturgis asked if there existed any formal TQM instruction. Mr. Guillen stated that it did not exist at the student level but that it was brought in at the Administration and Faculty level this year at TSTC. Mr. Hinojosa indicated that he would be teaching a course in TQM out of the Automated Manufacturing Technology Program that would be offered to all programs requiring it. Mr. Hinojosa wondered how QA/QC was so different between disciplines and wondered if that course could be taught to students of all programs. He asked the committee to consider that possibility.

Mr. Malloy asked Mr. Guillen to provide the committee with an idea of how many course slots and quarter hours availability existed for environmental courses. Mr. Guillen answered that the presently proposed curriculum had room for seven course slots totalling to 30 quarter hours. Mr. Malloy also wondered why the two Chemical Calculations courses were not included in the curriculum and recommended that perhaps the first course should be included.

Mr. Hinojosa suggested that we consider establishing course credit to a value that could be easily transferred to the semester hour value since the grant required that we provide a semester hour curriculum as well as a quarter hour curriculum.

Mr. Guillen then provided the committee a list of those areas of concern and items of pressing needs that the presently available courses recommended did not address. He mentioned that this list was used to identify a list of probable courses to include as the

environmentally specific courses in the curriculum. He provided the following list of probable course titles:

1. Air and Water Quality.
2. Safety and Emergency Response Plus Spill control and Emergency Response.
3. RCRA and Superfund.
4. Sampling and Analysis.
5. Basics of Industrial Hygiene and Right-to-Know Law.
6. Industrial Waste Stream Generation/Reduction/Treatment.
7. Introduction to Environmental Hazardous Materials Technology and 8 Hour HAZWOPER Course.

Mr. Guillen also provided a list of Laboratory specific course content objectives including the following:

1. Establish EPA procedures for Extraction and Analysis of Air, Soil, and Water Samples for Priority Pollutants.
2. Calibration, Use, and Maintenance of Analytical Instruments necessary for item 1 above.
3. Intra and Inter-laboratory Quality Control Procedures.
4. ISO 9000 Guidelines.

The committee discussed what Mr. Guillen presented and the following recommendations were agreed upon.

I. Delete the Technical/Business Report Writing Course.

II. Delete the Driving Course.

III. Delete the Organic Chemistry II.

IV. Add Chemical Calculations I.

V. Try to incorporate several environmental courses into two or three courses titled "Environmental Applications I", Environmental Applications II", and "Environmental

Applications III".

VI. Tie in regulations and hazardous materials into other courses and address them as procedures are taught for Water, Air, Soil, etc.

Mr. Guillen told the committee that he and Mr. Hinojosa would do everything possible to assure that the committee's recommendations were applied to the curriculum. Mr. Fullingim recommended that environmental courses should be taught early in the curriculum so that the students would identify with the program. All agreed with the value of his recommendation.

The committee then charged Mr. Hinojosa and Mr. Guillen to take the recommendations and create a curriculum for them to consider at the next meeting. Mr. Guillen told the committee that he would have a list of courses with the objectives each course would include.

The committee discussed the date for the next meeting and agreed on March 18, 1994.

TEXAS STATE TECHNICAL COLLEGE HARLINGEN

Third Steering Committee Meeting for
Environmental Technology
(Laboratory Analysis and Environmental Sampling)

Conference Center Board Room
Friday March 18, 1994, 10:00 A.M.

AGENDA

10:00 - 10:10	I.	Welcome and Introductions George H. McShan
10:10 - 10:15	II.	Approval of Minutes of Second Meeting
10:15 - 10:50	III.	Update of Project Activities and Review of Final Results Oscar Hinojosa and Al Guillen
10:50 - 11:05	IV.	Open Discussion and Interpretation of Final Results
11:05 - 2:50	V.	Work Session Review of Curriculum Draft, (12:00 - 12:45 Working Lunch and Recognition of Commitee Members) Review, Revise, Comment and/or Suggest Curriculum Changes Based on Findings and Interpretations
2:50 - 2:55	VI.	Other Business
2:55 - 3:00	VII.	Wrap up
3:00 - 4:00	VIII.	Tour of Facilities (Optional)

MINUTES
ENVIRONMENTAL ADVISORY COMMITTEE MEETING

MARCH 18, 1994
10:00 A.M.

MEMBERS PRESENT:

Darryl Knowles	TSTC Waco
James Earhart	Laredo Community College
Tom Malloy	Shell Development Company
William Lipps	Pan American Laboratories
Ruben Gonzalez	Phillips 66 Company
John Sturgis	TNRCC - Weslaco
Shirley Hammond	ARCO Chemical Company

SUBSTITUTES PRESENT:

David Hanawa	Ambiotec Environmental

TSTC REPRESENTATIVES:

George H. McShan	Dean of Instruction
Oscar Hinojosa	Grant Project Director
Alfonso Guillen, Jr.	Chair - Chemical Technology
Steven Vassberg	Associate Dean of Economic Development
Marizel Gutierrez	Project Secretary

GUESTS:

Frank Wright	Laredo Community College

Mr. George McShan, Dean of Instruction, welcomed the committee to TSTC - Harlingen. He expressed his appreciation to the committee's support and their visionary leadership that is helping TSTC in making a difference in providing education and training in environmental technology. He stated that May 19 and 20 will be the time we will go before the Coordinating Board with a new program review process. Again, he commended everyone for their contribution and input.

Mr. Darryl Knowles asked that each committee member introduce himself/herself and the company they represented. Mr. Knowles then asked that the committee consider approval of the minutes for the meeting held on December 3, 1993. The minutes were approved as written.

Mr. Knowles asked Mr. Oscar Hinojosa to proceed with his presentation, Update of Project Activities and review of final results.

Mr. Hinojosa began his presentation with a brief review of methods and procedures used in preparing for and conducting the mail survey. He proceeded by showing the break-down of the 177 surveys received into the same three categories as the preliminary results. These employer categories are private laboratories, manufacturers outside the Rio Grande Valley area and manufacturers in the Rio Grande Valley area. He stated that the purpose of this break-down is to enable us to explore if there are significant differences in the training required by these different groups. The percentage of responses is 23% which is considered good and only 2 percentage points below the 25% response rate targeted in the proposal. Next he presented the break-down of the 161 usable responses by categories, and indicated that most of the 16 responses not used came from respondents whose organizations do not have an environmental laboratory and do not use personnel for this or a closely related function.

Mr. Hinojosa then presented highlights of the final results. These included a brief description of the significance of the results for curriculum development and program planning. Among the important results is the estimated number of new Laboratory Analysis and Environmental Sampling persons needed in the next five years - 568 in Laboratory Analysis and 276 in Environmental Sampling. These numbers together with the average salary range, exceeding $17,250, indicates a definite need and justification for the development of this new and emerging technical program. Next Mr. Hinojosa presented graphs illustrating the break-down of the minimum level of education for entry level for laboratory analysis and environmental sampling and the break-down by category of employer. The data indicate that education at the level of two-year technical and community colleges had the largest number when compared with four-year colleges/ universities, high schools and other - 57 from 123 responses for laboratory analysis and 44, from 112 responses for environmental sampling.

Next Mr. Hinojosa presented a comparison by employer group of competency ratings, equipment use, areas of greatest environmental concern and most pressing need. With a few exceptions, the difference between groups was very small. Separately, the exceptions were listed as items with the greatest variance by group. Two of the items had been items of considerable discussion by the steering committee in a prior meeting. At this point Mr. Sturgis noted that the reversal of the rank order was still confusing to him and especially when he was trying to show the survey results to others. He asked that the averaged rank order correspond to the rank order in the survey instructions. Mr. Hinojosa agreed to make the change and distribute the revised version.

Mr. Hinojosa also presented comparison by employer group of average high and low salary, lowest and highest salary. Finally, he presented the need for technicians as generalized to the approximate systematic sample population and then as generalized to the total population. This generalization shows a need of 7,599 entry level technicians in laboratory analysis and 3936 in environmental sampling. Mr. Hinojosa pointed out that these numbers appear unrealistically high, and perhaps the generalization to the sample population does not hold true. Mr. Malloy agreed and suggested that those companies

which did not need this type of technicians, instead of responding to that effect, most probably threw the survey into the trash can.

Mr. Guillen presented the steering committee a draft curriculum which closely satisfied the needs the committee had identified at the last meeting along with those suggestions that industrial representatives had made during the visits that Mr. Hinojosa and Mr. Guillen made during January 1994. He thanked those members of the committee that had hosted him and Mr. Hinojosa mentioning that the visits were indeed very worthwhile. He mentioned that he had a special attraction to the manufacturing industry because that industry offered the graduates a significantly higher entry level salary than the independent or local laboratories. He also showed the committee the quarterly and semester curriculum drafts.

Mr. Guillen focused on the quarterly curriculum due to Texas State Technical College's intent to instruct the curriculum within the next calendar year. He stated that the curriculum had turned out to be a very attractive one, taking into account the Higher Education Coordinating Board requirements, the Chemical Technology course inclusions and the nine newly identified Environmental Technology courses.

Mr. Guillen mentioned that the curriculum was going to be very demanding on the students with there being only one quarter in which the students would be taking a course load of fifteen (15) credit hours and all other quarters requiring a higher course burden. He took the committee through the quarterly course offering sequence stressing a need for the entry student to be at the College Algebra and Composition I level before they could enroll in any Chemical Technology course or Environmental Technology course. He indicated that this might require those students that did not have the high school background to challenge College Algebra or Composition I to take remedial English or Math courses. This might cause a student to be enrolled for up to two years instead of the eighteen months that the curriculum shows.

Mr. Guillen additionally mentioned that two suggestions that had been presented by the steering committee at the second meeting had been reviewed and one had been implemented while the other was still being considered. He mentioned that the suggestion to include the Chemical Calculations I & II courses in the curriculum as Mr. Tom Malloy had suggested had been reiterated by industry representatives during the January tour. The two courses were included into the curriculum. The second suggestion that the environmental courses be entitled Environmental Applications I, II, and III was considered but the flexibility required existed while still being able to entitle each course independently. He suggested that the course titles be accepted as presented unless they committee preferred differently. The committee did not comment and it was taken as acceptance of the recommendation.

Mr. Guillen then presented each of the Environmental Course outlines, their objectives, and their task listing. Upon presenting the steering committee the course outline and objectives list for ENV - 100, INTRODUCTION TO ENVIRONMENTAL TECHNOLOGY, Mr.

John Sturgis, district manger for TNRCC, volunteered his agency and representatives of his agency to participate in the orientation and various technical presentation of the curriculum. Mr. Guillen mentioned that he had already spoken to Mr. Charlie Webster about presentations on sampling procedures and other subjects. Mr. Guillen added that TNRCC personnel had been identified to present a unit on Sampling Quality Assurance/Quality Control as well as Chain-of-Custody requirements. Mr. Guillen asked the committee to please suggest any additions, deletions, or amendments to each of the course outlines, objectives, and or task listing presented. The following comments were submitted by the committee for each of the courses reviewed:

ENV - 100 INTRODUCTION TO ENVIRONMENTAL TECHNOLOGY

1. Involve TNRCC Personnel in the orientation portion of the curriculum.

ENV - 110 SAFETY IN THE WORKPLACE - CLEANUP AND SPILL CONTROL OF HAZARDOUS MATERIALS

1. Add to the course objectives the DOT 173 HAZMAT Tables and the 29-40CFRs.
2. Add to the course objectives the above at the appropriate level for the course.
3. Add to the course objectives the requirement to meet OSHA's HAZCOM Federal Regulation. (Hazard Communications Act)

ENV - 210 SAMPLE COLLECTION AND STORAGE

1. The course content may be too much to cover in one course. Consider what protocols to use and teach students how to look them up.
2. Emphasize to the student why sampling protocols are necessary.
3. Add to the course content ETHICAL requirements as they apply to sampling and include ethics in every course. Discuss Ethics within the Corporate Framework.
4. Discuss determination of correct procedures in sampling as well as detection limit concerns.

ENV - 220 ENVIRONMENTAL SAMPLE CHARACTERIZATION AND ANALYSIS

1. Include Ethics and SCANS requirements.
2. Introduce the students to the thirty nine (39) chemicals on the TCLP list.
3. Discuss sediment and sludge analysis when presenting soil analysis.
4. Discuss city water/wastewater requirements when presenting water analysis.

5. Assure that you present the fact that air samples must be frozen when stored.
6. Change Oil and Grease analysis to read the analysis of oils and greases.

ENV - 310 INSTRUMENTAL ANALYSIS OF WATER, SOIL, AND AIR

1. Use and assure the students use the Standards Methods Manual for water analysis.
2. Change oil and grease analysis to read analysis of oils and greases.

ENV - 320 HAZARDOUS MATERIALS EMERGENCY RESPONSE AND WASTE OPERATIONS (HAZWOPER)

1. Assure that the course outline satisfies the directives in 29CFR.
2. EPA 165.15 is the syllabus for HAZWOPER.

ENV - 340 ADVANCED ENVIRONMENTAL ANALYSIS, REGULATIONS, PERMITS, AND COMPLIANCE.

1. Change spelling of Thalates to phthalates.

Mr. Guillen showed the steering committee transparencies of the matrices comparing the Environmental Technology courses versus the surveyed competencies, areas of greatest concern, equipment list, and the most pressing needs. He stated that as compared to the Chemical Technology courses, when one looked at both matrices, no item was left unaddressed.

A letter submitted by Dr. Earhart recommending that the curriculum include a course with components of Biology and some toxicology. Dr. Earhart supported his recommendation and the committee agreed with the validity of his concerns. A review of the quarterly curriculum was conducted and a decision to delete Unit Operations I, CHT - 304 was agreed upon. In its place a Biology course introducing topic concerning environmental toxicology was recommended. Mr. Guillen and Mr. Hinojosa indicated that they would work closely with Dr. Earhart to decide what the course would contain and to what extent to develop the course. The course will be included in the sixth (6th) quarter of the curriculum and shall be called ENV - 320, Environmental Toxicology.

The last item of discussion was the semester curriculum. Mr. Guillen stated that he had a shortage of time and an excess of credits. (See attachment) He asked the committee to recommend how he and Mr. Hinojosa might be able to solve this dilemma. Mr. Knowles suggested that one way to reduce the credit hour was to reduce the presently allocated four (4) hours of lecture per week for CHT - 121, 125, and 205 to three (3) hours per week.

Mr. Knowles recommended that Mr. Guillen consider deleting the Seminar course and if necessary use a CHT course as an option for the Elective course in the SEMESTER curriculum. Mr. Guillen stated that those options would resolve the problem but expressed a concern regarding the amount of material to be covered in the semester time frame.

NOTE: During the working lunch, Dr. J. Gilbert Leal presented each of the committee members a certificate of appreciation. He thanked each member personally and the agencies which they represented. The committee viewed a video on Texas State Technical College. The committee also toured the Chemical Technology laboratories and classrooms.

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ENVIRONMENTAL TECHNOLOGY
(Laboratory Analysis and Environmental Sampling)

APPENDIX C

1. Final Survey Results
2. Comments to Questions 10 and 14
3. Cover Letter
4. Summary of Industrial Visits
5. Responses to Needs Interview Protocol

BEST COPY AVAILABLE

Texas State Technical College Harlingen

ENVIRONMENTAL TECHNOLOGY SURVEY
(Laboratory Analysis & Environmental Sampling)

FINAL RESULTS

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ENVIRONMENTAL TECHNOLOGY S
(Laboratory Analysis & Environmenta

FINAL RESULTS

58

5. If you answered "yes" to question 4, how many staff in your organization work on:

Laboratory Analysis? 1332 persons Both areas? 504 persons
Environmental sampling? 577 persons

6. What are the minimum qualifications in your organization for the following persons?

	Years of Work Experience	Level of Education (Degree)				
		PhD	MS	BS	AAS	HS
person supervising Laboratory Analysis	6	7	7	92	7	2
person working in Laboratory Analysis	1.9	0	0	36	37	25
person supervising Environmental sampling	5	1	3	74	11	11
person working in Environmental sampling	2.3	1	1	29	28	33

7. What is the minimum level of formal education for entry-level Environmental Technician personnel (Laboratory Analysis & Environmental Sampling)?

LABORATORY ANALYST

30 four-year colleges and universities
57 two-year technical and community colleges
34 high school
2 other (please specify)

ENVIRONMENTAL SAMPLING

23 four-year colleges and universities
44 two-year technical and community colleges
43 high school
2 other (please specify)

8. Please estimate the number of Environmental Technicians your company would likely hire (new and replacement) during the next 5 years?

Laboratory Analysis: 568
Environmental Sampling: 276

9. In your company, what would be the likely range of hourly wage/salary for:

a. an entry level laboratory analyst $18,073* to $23,263

b. an entry level environmental sampling technician $17,250 to $22,235

***Figures are based on yearly wages.**

5. If you answered "yes" to question 4, how many staff in your organization work on:

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ENVIRONMENTAL TECHNOLOGY
(Laboratory Analysis and Environmental Sampling)

COMPETENCY RATINGS
Comparison by Group
********Directions********

Please read each Competency carefully and decide whether or not the competency is required. If it is required, write the corresponding scale number in the spaces to the left of each competency.

SCALE: 1- HIGH - the job cannot be done without this
2- MEDIUM- needed to do the job
3- LOW - rarely needed to do the job

If not applicable leave the competency rating blank

1.1	17.	Use good laboratory practice and standard operating procedures
1.1	1.	Practice laboratory and job safety
1.2	6.	Analyze samples in accordance with regulations
1.2	16.	Apply QA/QC procedures
1.3	11.	Know and follow regulations and protocols
1.3	9.	Calibrate and keep records of analytical instruments
1.3	5.	Prepare samples
1.4	21.	Manage time
1.5	19.	Maintain records from collection to disposal of samples
1.5	2.	Prepare reagents
1.5	22.	Communicate effectively orally and in writing
1.5	4.	Perform sampling tasks from collection to disposal
1.6	3.	Prepare sample container
1.6	20.	Use personal computer (LIMS & PC's)
1.6	7.	Prepare reports
1.6	15.	Interpret and evaluate data
1.6	18.	Present and defend analytical results
1.9	13.	Train employees
1.9	12.	Develop procedures and plans
1.9	10.	Maintain inventory of chemicals and reagents
2.0	8.	Maintain and sterilize glass
2.0	23.	Drive safely
2.3	24.	Read flow sheets (unit operations)
2.4	14.	Arrange contract services
_____	25.	Other _____

ENVIRONMENTAL TECHNOLOGY
(Laboratory Analysis and Environmental Sampling)

COMPETENCY RATINGS
Comparison by Group
********Directions********

Please read each Competency carefully and decide whether or not the competency is required. If it is required, write the corresponding scale number in the spaces to the left of each competency.

SCALE: 1- HIGH - the job cannot be done without this
2- MEDIUM- needed to do the job
3- LOW - rarely needed to do the job

If not applicable leave the competency rating blank

1.1	17.	Use good laboratory practice and standard operating procedures
1.1	1.	Practice laboratory and job safety
1.2	6.	Analyze samples in accordance with regulations
1.2	16.	Apply QA/QC procedures
1.3	11.	Know and follow regulations and protocols
1.3	9.	Calibrate and keep records of analytical instruments
1.3	5.	Prepare samples
1.4	21.	Manage time
1.5	19.	Maintain records from collection to disposal of samples
1.5	2.	Prepare reagents
1.5	22.	Communicate effectively orally and in writing
1.5	4.	Perform sampling tasks from collection to disposal
1.6	3.	Prepare sample container
1.6	20.	Use personal computer (LIMS & PC's)
1.6	7.	Prepare reports
1.6	15.	Interpret and evaluate data
1.8	18.	Present and defend analytical results
1.9	13.	Train employees
1.9	12.	Develop procedures and plans
1.9	10.	Maintain inventory of chemicals and reagents
2.0	8.	Maintain and sterilize glass
2.0	23.	Drive safely
2.3	24.	Read flow sheets (unit operations)
2.4	14.	Arrange contract services
_____	25.	Other _____

TEXAS STATE TECHNICAL COLLEGE HARLINGEN
ENVIRONMENTAL TECHNOLOGY
(LABORATORY ANALYSIS & ENVIRONMENTAL SAMPLING)

Comments are to:

Question 10: What are the future education and training needs for environmental technicians (Laboratory Analysis and Environemntal Sampling) in your company?

Question 14: Other comments:

RESP. CODE	ZIP	NO OF EMPL.		COMMENTS
009-L	75061	4	10.	Unknown
013-L	75201	8	10.	Computer skills, air sampling; dot shipment regs.
032-L	75229	12		
034-L	75229	15	10.	Computer courses/ safety/ QAQC/ instrumental.
035-L	75235	6		
042-L	71247	15	10.	On job
049-L	76004	8	10.	See notes in comments.
			14.	Most technicians, and many BS, do not have adequate manipulative skills such as titnalian and balance operations, let alone reagent preparation.
055-L	76504	8	10.	undetermined at this point.
			14.	Cost is a major factor in continuing education/training. We have a limited budget.
058-L	76903	2	10.	Computer skills, regulations, lab procedures, mathematics.
			14.	Thanks for your interest.
065-L	77011	24	10.	In the past we have utilized high school graduates & seniors from HISD-Milby petrochem program. These are usually college bound students with very good intelligence. We don't teach them chemistry--only E.P.A. analytical protocols. We would want future technicians to at least have H.S. chemistry.
			14.	We have never had a problem in finding qualified technicians. There are plenty presently available. This job market will continue to require new people but saturations was reached about two years ago and is now leveling out.
069-L	77021	9	10.	We like to see everyone complete their BS.
073-L	77025	55	10.	Trained by company and/or offsite training satool depending on position.
075-L	77029	6	10.	Degree in chemistry.
080-L	77036	6	10.	QA/QC, knowledge of regulation, new analytical techniques.
082-L	77040	40	10.	Ascet certification, NICET certificates, OSHA cc hr safety course.
085-L	77063	20		
111-L	77081	35	10.	sampling--EPA, OSHA and TDH regulatory requirements. laboratory-EPA, OSHA and TDH regulatory requirements.
118-L	77089	26	10.	basic water, soil, sludges. EQUIPMENT USE: 37.Lust; 38.Coliwasa; 39.Shelby Tube;
134-L	77331	21	10.	wet chemistry for water, construction analysis, A.A, GC.

TEXAS STATE TECHNICAL COLLEGE HARLINGEN
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242-L	78712	10	10.	comes with the job.
245-L	78758	2	10.	cont. education/necessary training to meet federal and state requirements.
				EQUIPMENT USE: Air
250-L	79101	4	10.	trained lab technicians.
255-L	79101	11	10.	continuing ed for advanced techniques (GC-MS, ICP-MS, ICP-OES)
259-L	79698	7	10.	To attend seminars on rules & regulations.
260-L	79756	8	14.	We are not an environmental laboratory. Our primary business is involved with the oil industry in primary, secondary, and tertiary oil recover. however, we also do studies on agricultural, domestic, process, and other industrial water.
264-L	79935	6	10.	QA/QC, indstrumental analysis.
266-L	79901	6	10.	College and environmental certifications.
267-L	79912	5	10.	♦40 hrs OSHA ♦Asbestos inspector
			14.	Very interested, but no time/money. (He is referring to question 13)
045-M	79110	2		
135-M	76110			
159-M	76567	17	10.	Specific training on instrumental equipment.
163-M	76657		10.	At this point we do not have anyone specifically trained in environmental
			14.	In my company, the greatest need along the lines of environmental technology is some who understands the regulations and knows how to interface with EPA and similar agencies.
216-M	77471			
262-M	77704	26	10.	about the same as presently have.
301-M	78403	5		
305-M	78469	10		
312-M	78654	120	10.	Currently we do not have either position. If the amount regulations by EPA, TWC etc continue to increase a position may be present in the next 5 years.
320-M	78721	24	10.	Prospective employees should have more hands-on experience with analytical instruments, methodologies, and computer skills.
323-M	78758	5	10.	Microbiologist, analytical chemist
329-M	79058	2	10.	Federal government classifies all technicians as physical scientist, and downsizing of our agency shows no needs.
331-M	79065		10.	We need a person with more depth than a technician. We need someone who can execute the entire program of poll. control.
335-M	79120	12	10.	In the near future I see an increased need for better trained environmental people.
342-M	79760	27	10.	There is always room for new knowledge.
010-V	78503		14.	The industries in the border region are interesting in hiring people with knowledge in how to do the things. There are not to much necessity for samplers techs.
031-V	3679	2	14.	Internship programs may be helpful.
086-V	78550	6	10.	HPLC techniques microbiological assays, spectrophotometry techniques.
			14.	(This has occurred multiple times.) I have had problems with TSTC grads working well

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166-L	78028		10. QA/QC, wet chemistry, SDWA Micro (total coliform) and assoc. paperwork. 14. You might want to contact the TWUA/LAS (Texas Water Utilities Association/Lab Analyst Section) to put this survey in more hands. The current editor is Mike Urrutia, (210) 379-5822.
177-L	78217	1	
187-L	78238	2	
194-L	78228	170	
202-L	78408	13	10. Basic chemistry, QA/QC, math skills. 14. Our company fully supports the education of any full time employee. Participation by the employee in educational program is purely voluntary.
213-MX	78469	20	
218-L	78703	2	
226-L	78733	5	10. Safe Laboratory practices & knowledge of analytical methods. EQUIPMENT USE: Know how to pull representative samples from sample Jar for Analysis.
233-L	78744	200	14. Company pays for outside courses for employees if they want to attend.
238-L	78752	6	10. #1 safety training, #2 standard operating procedures, #3 environmental protocol, #4 equipment & instrumentation training. COMPETENCY RATING: Repair & Care for all field equipment. EQUIPMENT USE: 37. Water level probes, Interface probes 38. Combustible gas, O2, H25 & other safety meters.
238-L	78752	22	10. Maintaining current knowledge of the environmental regulatory framework--which drives our work. 14. Travel may be a problem since I am located in Austin.
253-L	79101	2	10. Knowledge of EPA regulations and analytical protocol, QA/QC improvement. 14. Since opening the lab 2 1/2 years ago, I have noticed a large number of people trying to become environmental specialists, consultants etc.. But without any training, the fact that TSTC and other educational institutions are providing this type of education can only increase the number of people with much needed skills.
256-L	79407	10	10. Keep current with changes in regulations, be informed on QA/QC.
261-L	79701	9	
014-M	75034	5	10. Computer skills and indepth analytical work i.e. training EPA methods and equipment. EQUIPMENT USE: 37. Auto Sampler (ISCO) 38. Manual Sampling (Bio-Test) 39. Sample Procedrues (Representative)
019-M	75042		
039-M	75090		
043-M	75149	1	10. Almost all lab work is being contracted to outside labs.
065-M	75668	6	10. Need some more full time chemistry trained personnel, with formal education. 14. Time constraints & regulations are a problem--They are constantly changing.
070-M	75237		14. There is not enough work for full time environmental technicians. We will continue to use consultants when needed.
076-M	75243		10. Unknown 14. Because our plant is primarily air separation, the only hazards we impose on the environment might be in the waste water.
088-M	75220	3	10. Training will be give or taken as we see necessary.

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354-M	79927	2	10. Stack testing (VOC's)
004-V	78502	2	
069-V			
070-V	78523		14. We are exporters of used clothing and manufacturers of mextile wipers.
085-V	78550		
089-V	78550		10. Send them to technical training seminars sponsored by different organizations. (T.D.H. Quality Checked)
112-V	78582		14. We strictly involved in buying chemicals O/S, Tert. other Aec. and retailing them. We do not do any testing or lab work.
118-V	78593	4	
124-V	78521		14. Our company has need for professional to handle total enviro. & safety programs. Lab analysis & sampling are minimal tasks at this facility.
127-V	78523		10. BS in chemistry degrees.
129-V	MEX	5	
076-L	77030	16	10. Use of GC, GC/MS, ICP, AA, HPLC, LC & IC, ICP/MS
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247-L	78767	22	10. Math skills, computer skills, automation GALP, GC/MS, ICP, AA, GC, HPLC.
272-MX	79915	13	
002-M	66031		10. Not at this time.
014-M	75034	7	10. Chemistry; computers, protocol for sampling, regulates lab equipments.
192-M	77019		
223-M		5	10. The current educational curriculum offered at TSTC in chemical technology is about right. We don't environmental sampling technicians. 14. I don't feel that an environmental technology specialization is of particular interest to Ethly Corp. I would prefer to have a chemical technology graduate and train them on specific environmental related duties.
244-M	77562		10. None at this plant.
246-M	77571	5	10. More on the job training rather than outside training. 14. We really do not anticipate using TSTI as we have good success with our technicians coming from our own labor force.
272-M	77977	2	10. Certification in waste water treatment.
288-M	78227		
303-M	78410	12	
313-M	78664	28	10. Microbiologists and chemists--Degreed.
345-M	79905		
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2424 BOXWOOD
HARLINGEN, TX. 78550-3697
210 / 425-0600

October 15, 1993

FIELD(1)
FIELD(2)

Attn: Environmental Lab Director

Through a state-wide survey, Texas State Technical College seeks to determine the need and scope of training in Environmental Technology (Laboratory Analysis and Environmental Sampling). Our best information comes from you, the potential employer.

We need your participation. We realize that completing this survey will require some effort. If you feel that there is another person in your company in a more appropriate position to respond, please forward the survey to that person. Please return the completed survey, equipment use and competency rankings by October 28, 1993. A pre-addressed, postage paid envelope is included for your convenience.

We greatly appreciate your assistance. Please be assured that all responses will be kept confidential and that participation in no way obligates you or your company. If you have questions, please contact me at (210) 425-0605 or Alfonso Guillen at (210) 425-0758.

Sincerely,

Oscar V. Hinojosa
Coordinator of Curriculum

Texas State
Technical College
Harlingen
2424 BOXWOOD
HARLINGEN, TX. 78550-3697
210 / 425-0600

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Environmental Technology
(Laboratory Analysis and Environmental Sampling)

Summary of Industrial Visits January 11-14

The week of January 11-14, Al Guillen and Oscar Hinojosa visited five chemical/petro-chemical manufacturing plants, one U.S. laboratory, and one independent laboratory in the Corpus Christi to Houston area. The purpose of the visits was to expand the knowledge base of information regarding laboratory analysis and environmental sampling through on-site, one-to-one conversations with knowledgeable and experienced individuals in these fields.

During the visits we spoke with and/or interviewed more than twenty-five technical and managerial people who specialize in laboratory analysis and/or environmental sampling.

The following paragraphs summarize the results of our visits:

In general, the information we received parallels and confirms the information we already have from our mail survey.

All chemical/petro-chemical manufacturing plants, to a greater or lesser extent, contract environmental laboratory services to private laboratories. In one large organization, fifteen million and ten million dollars worth of environmental services were contracted in the past two years. At another large organization nearly all the environmental work is done in the plant, while a very small amount of special work is contracted.

Change is a way of life in all organizations visited. Some of the organizations visited project to have more laboratory work done on a contract basis, others less; several project to change the minimum educational requirements for entry-level laboratory analysts - from BS to AAS in one case, from H.S. to AAS in another, and from no training while on the job to continuing education in another case.

All of the manufacturing plants visited use HP 5890 Gas Chromatographs. It seems to be the most commonly used instrument.

Items that surfaced which represent new information are: (1) two organizations project to have computer networks in the near future for the transfer of environmental data and reports throughout their organizations; (2) one organization uses robots and projects to increase their use in their environmental work; and (3) one research group visited stated that if time was a factor in the curriculum, technology should be sacrificed over theory.

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Specific Needs/Qualification Interview Protocol
Environmental Technology Study
(Laboratory Analysis and Environmental Sampling)

Respondent Name _____ Title *Analytical Lab Supervisor*

Organization Name *INDV - M1* Telephone _____

I. RESPONDENT'S BACKGROUND.

A. What is your job title/responsibility?

Analytical Laboratory Supervisor

B. How much experience do you have in Laboratory Analysis and Environmental Sampling, and how long did you perform those duties? *12*

How long has it been since you performed or supervised these duties? _____

Doing now

C. How many technicians do you supervise presently or are employed by the company you work for at your location? *12*

II. ENTRY LEVEL ASSESSMENT.

A. If you NOW supervise or perform these specific duties of Environmental Technicians (Laboratory Analysis and Environmental Sampling), please respond to the following questions:

1. What are the specific analytical instruments an entry level technician needs to be able to operate?

Gas Chromatograph, Total Organic Carbon Analyzer, Microwave Digestion Analyzer for Chloride, Automatic Titrator, PH Meter, Ion Chromatograph.

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I. RESPONDENT'S BACKGROUND.

A. What is your job title/responsibility?

Analytical Laboratory Supervisor

B. How much experience do you have in Laboratory Analysis and Environmental Sampling, and how long did you perform those duties? *12*

How long has it been since you performed or supervised these duties? _____

Doing now

C. How many technicians do you supervise presently or are employed by the company you work for at your location? *12*

II. ENTRY LEVEL ASSESSMENT.

A. If you NOW supervise or perform these specific duties of Environmental Technicians (Laboratory Analysis and Environmental Sampling), please respond to the following questions:

1. What are the specific analytical instruments an entry level technician needs to be able to operate?

Gas Chromatograph, Total Organic Carbon Analyzer, Microwave Digestion Analyzer for Chloride, Automatic Titrator, PH Meter, Ion Chromatograph.

Specific Needs/Qualification Interview Protocol
Environmental Technology Study
(Laboratory Analysis and Environmental Sampling)

Respondent Name _____ Title *Sr. Staff Res. Chemist*

Organization Name *INDV - M2 - 1* Telephone _____

I. RESPONDENT'S BACKGROUND.

A. What is your job title/responsibility?

B. How much experience do you have in Laboratory Analysis and Environmental Sampling, and how long did you perform those duties? *34 years in laboratory analysis and 18 years in environmental sampling.*

How long has it been since you performed or supervised these duties? *Still performing these duties.*

C. How many technicians do you supervise presently or are employed by the company you work for at your location? *None*

II. ENTRY LEVEL ASSESSMENT.

A. If you NOW supervise or perform these specific duties of Environmental Technicians (Laboratory Analysis and Environmental Sampling), please respond to the following questions:

1. What are the specific analytical instruments an entry level technician needs to be able to operate?

   Volumetric measuring devices.
   Pippettes, Volumetric Flasks, Graduated Cylinders.

2. What are the principal specific analytical procedures an entry level technician is expected to know and use?

Specific Needs/Qualification Interview Protocol
Environmental Technology Study
(Laboratory Analysis and Environmental Sampling)

Respondent Name _____ Title *Sr. Staff Res. Chemist*

Organization Name *INDV - M2 - 1* Telephone _____

I. RESPONDENT'S BACKGROUND.

A. What is your job title/responsibility?

B. How much experience do you have in Laboratory Analysis and Environmental Sampling, and how long did you perform those duties? *34 years in laboratory analysis and 18 years in environmental sampling.*

How long has it been since you performed or supervised these duties? *Still performing these duties.*

C. How many technicians do you supervise presently or are employed by the company you work for at your location? *None*

II. ENTRY LEVEL ASSESSMENT.

A. If you NOW supervise or perform these specific duties of Environmental Technicians (Laboratory Analysis and Environmental Sampling), please respond to the following questions:

1. What are the specific analytical instruments an entry level technician needs to be able to operate?

   Volumetric measuring devices.
   Pippettes, Volumetric Flasks, Graduated Cylinders.

2. What are the principal specific analytical procedures an entry level technician is expected to know and use?

Specific Needs/Qualification Interview Protocol
Environmental Technology Study
(Laboratory Analysis and Environmental Sampling)

Respondent Name _____ Title *Technical Associate*

Organization Name *INDV - M2 -2* Telephone _____

I. RESPONDENT'S BACKGROUND.

A. What is your job title/responsibility?

I am assigned to the Industrial Hygiene Lab. I perform analysis for_____ industrial hygienists at many _____ locations. I give sampling requirement guidance.

B. How much experience do you have in Laboratory Analysis and Environmental Sampling, and how long did you perform those duties? *23 yrs. laboratory experience, 10 yrs. in industrial hygiene lab.*

How long has it been since you performed or supervised these duties? *daily*

C. How many technicians do you supervise presently or are employed by the company you work for at your location? *Our group (industrial hygiene lab now has 2 technicians and 1 chemist.*

II. ENTRY LEVEL ASSESSMENT.

A. If you NOW supervise or perform these specific duties of Environmental Technicians (Laboratory Analysis and Environmental Sampling), please respond to the following questions:

1. What are the specific analytical instruments an entry level technician needs to be able to operate?

Gas Chromatograph
Liquid Chromatographer
Micro Balance (Gravimetric weighing)

Specific Needs/Qualification Interview Protocol
Environmental Technology Study
(Laboratory Analysis and Environmental Sampling)

Respondent Name _____ Title *Technical Associate*

Organization Name *INDV - M2 -2* Telephone _____

I. RESPONDENT'S BACKGROUND.

A. What is your job title/responsibility?

I am assigned to the Industrial Hygiene Lab. I perform analysis for_____ industrial hygienists at many _____ locations. I give sampling requirement guidance.

B. How much experience do you have in Laboratory Analysis and Environmental Sampling, and how long did you perform those duties? *23 yrs. laboratory experience, 10 yrs. in industrial hygiene lab.*

How long has it been since you performed or supervised these duties? *daily*

C. How many technicians do you supervise presently or are employed by the company you work for at your location? *Our group (industrial hygiene lab now has 2 technicians and 1 chemist.*

II. ENTRY LEVEL ASSESSMENT.

A. If you NOW supervise or perform these specific duties of Environmental Technicians (Laboratory Analysis and Environmental Sampling), please respond to the following questions:

1. What are the specific analytical instruments an entry level technician needs to be able to operate?

Gas Chromatograph
Liquid Chromatographer
Micro Balance (Gravimetric weighing)

Specific Needs/Qualification Interview Protocol
Environmental Technology Study
(Laboratory Analysis and Environmental Sampling)

Respondent Name _____ Title *Research Technician & Supervisors (5)*

Organization Name *IND V - M2 - 3* Telephone _____

I. RESPONDENT'S BACKGROUND.

A. What is your job title/responsibility?

One - Research Technician
Others - Chemists

B. How much experience do you have in Laboratory Analysis and Environmental Sampling, and how long did you perform those duties? *2 to 20 yrs.*

How long has it been since you performed or supervised these duties? *daily*

C. How many technicians do you supervise presently or are employed by the company you work for at your location? *N/A*

II. ENTRY LEVEL ASSESSMENT.

A. If you NOW supervise or perform these specific duties of Environmental Technicians (Laboratory Analysis and Environmental Sampling), please respond to the following questions:

1. What are the specific analytical instruments an entry level technician needs to be able to operate?

Gas Chromatograph with Purge and Trap, Mass Selective Detectors, Wet Chemistry Glassware, Standard Operating Procedures in Calibration, Sample containers, TOC Analyzer, Computer, Distillation Apparatus, Ion Chromatograph.

Specific Needs/Qualification Interview Protocol
Environmental Technology Study
(Laboratory Analysis and Environmental Sampling)

Respondent Name _____ Title *Research Technician & Supervisors (5)*

Organization Name *IND V - M2 - 3* Telephone _____

I. RESPONDENT'S BACKGROUND.

A. What is your job title/responsibility?

One - Research Technician
Others - Chemists

B. How much experience do you have in Laboratory Analysis and Environmental Sampling, and how long did you perform those duties? *2 to 20 yrs.*

How long has it been since you performed or supervised these duties? *daily*

C. How many technicians do you supervise presently or are employed by the company you work for at your location? *N/A*

II. ENTRY LEVEL ASSESSMENT.

A. If you NOW supervise or perform these specific duties of Environmental Technicians (Laboratory Analysis and Environmental Sampling), please respond to the following questions:

1. What are the specific analytical instruments an entry level technician needs to be able to operate?

Gas Chromatograph with Purge and Trap, Mass Selective Detectors, Wet Chemistry Glassware, Standard Operating Procedures in Calibration, Sample containers, TOC Analyzer, Computer, Distillation Apparatus, Ion Chromatograph.

Specific Needs/Qualification Interview Protocol
Environmental Technology Study
(Laboratory Analysis and Environmental Sampling)

Respondent Name_____ Title: *Technicians & Supervisors (6)*

Organization Name *INDV - M3* Telephone _____

I. RESPONDENT'S BACKGROUND.

A. What is your job title/responsibility?

B. How much experience do you have in Laboratory Analysis and Environmental Sampling, and how long did you perform those duties? *2-20 years*

How long has it been since you performed or supervised these duties? _____

Doing now.

C. How many technicians do you supervise presently or are employed by the company you work for at your location? *60*

II. ENTRY LEVEL ASSESSMENT.

A. If you NOW supervise or perform these specific duties of Environmental Technicians (Laboratory Analysis and Environmental Sampling), please respond to the following questions:

1. What are the specific analytical instruments an entry level technician needs to be able to operate?

Gas Chromatograph
Atomic Absorption Flame/Graphite Furnace
High Performance Liquid Chromatograph
Analytical Balances
Auto-Titrators
Purge & Trap Analysis
Hack Kit
Inductively coupled Spec.
pH

2. What are the principal specific analytical procedures an entry level technician is expected to know and use?

Present CHT skills plus Biological Oxygen Demand, Congurmed Oxygen Demand, Total Organic Carbon Analyzer, Total Suspended Solids, Atomic Absorption Spectrophotometer, Auto Filtration, Total Water, Alkalinity, Acidity, Ammonia

3. What are the principal QA/QC procedures an entry level technician is expected to know and use?

Mean
Standard Deviation
Control tables
EPA Requirements
Statistical Use of Coefficient of Variance

4. What type of formal reports is an entry level technician required to write?

None. Technicians must be able to communicate orally and in writing.

5. What two specific skills did you wish your entry level technicians had that they did not have?

Knowledge of sample containers (which sample types go in which container types). Computer skills - Lotus, Windows
Awareness of EPA Permitting & Regulations.

B. Please offer any additional comments we should consider in developing this curriculum.

COMMENTS: _____ *cautioned us not to focus too much on environmental but to consider the bio tech & pharmaceutics areas. He believes these are the growth areas of the future.*

Interviewer Name Al Guillen & Oscar V. Hinojosa Date *1-12-94*

Specific Needs/Qualification Interview Protocol
Environmental Technology Study
(Laboratory Analysis and Environmental Sampling)

Respondent Name _____ Title *Environmental Lab Manager*

Organization Name *INDV - M4* Telephone _____

I. RESPONDENT'S BACKGROUND.

A. What is your job title/responsibility?

Environmental Lab Manager

B. How much experience do you have in Laboratory Analysis and Environmental Sampling, and how long did you perform those duties? *10+ years*

How long has it been since you performed or supervised these duties? _____

Supervising duties of Lab Technicians now

C. How many technicians do you supervise presently or are employed by the company you work for at your location? *35*

II. ENTRY LEVEL ASSESSMENT.

A. If you NOW supervise or perform these specific duties of Environmental Technicians (Laboratory Analysis and Environmental Sampling), please respond to the following questions:

1. What are the specific analytical instruments an entry level technician needs to be able to operate?

Gas Chromatograph, Gas Chromatograph with Mass Selective Detector, electrolytic conductivity detector capillary technology & data systems Percent Hydronium Ions (Acidity or Basidity), Ion Chromatography, Inductively Coupled Plasma Spectrophotometer, Atomic Absorption

Spectrophotometer with graphite, wet chem analyzer; Ion specific electrodes, Total Organic Carbon Analyzer, Auto-Titrator.

2. What are the principal specific analytical procedures an entry level technician is expected to know and use?

   Documentation; attention to details; basic lab practices and knowing why. Gas Laws!

3. What are the principal QA/QC procedures an entry level technician is expected to know and use?

   The use of spikes and blanks; determination of recovery rates; knowledge of control limits; documentation; chain of custody; preparation of standards, use of computer - Excel, Lotus, Windows.

4. What type of formal reports is an entry level technician required to write?

   Mostly no formal reports. Most analyst do results summary.

5. What two specific skills did you wish your entry level technicians had that they did not have?

   Basic lab practices
   Documentation
   pH
   Sampling Head Space Preservation.
   Air Testing
   Characterization of Garbage
   Chain of Custody
   Temperature

B. Please offer any additional comments we should consider in developing this curriculum.

COMMENTS: *The direction (trend) is toward automation (robotics), electronic transfer of data and documentation, computer networking. Requirement for mechanical skills.*

Interviewer Name *Al Guillen & Oscar V. Hinojosa* Date *1-13-93*

Specific Needs/Qualification Interview Protocol
Environmental Technology Study
(Laboratory Analysis and Environmental Sampling)

Respondent Name _____ Title *Environmental Engineer*

Organization Name *INDV - M5* Telephone _____

I. RESPONDENT'S BACKGROUND.

A. What is your job title/responsibility?

B. How much experience do you have in Laboratory Analysis and Environmental Sampling, and how long did you perform those duties? *12 yrs.*

How long has it been since you performed or supervised these duties? *N/A*

C. How many technicians do you supervise presently or are employed by the company you work for at your location? *5 (sampling & monitoring only)*

II. ENTRY LEVEL ASSESSMENT.

A. If you NOW supervise or perform these specific duties of Environmental Technicians (Laboratory Analysis and Environmental Sampling), please respond to the following questions:

1. What are the specific analytical instruments an entry level technician needs to be able to operate?

VOG Detector (Volatile Organic Gases)
Polycorder (Transfers data from VOG to Computer data base.)
Tools - First level repair of valves, pumps etc.
Bar Code Reader
Computer

2. What are the principal specific analytical procedures an entry leve technician is expected to know and use?

Sampling Protocol
Chain-of-Custody
Regulation & EPA 600 series familiarity

3. What are the principal QA/QC procedures an entry level technician is expected to know and use?

Calibration Procedures & Requirements
Documentation of Calibrations, Standard Prep, Sampling & Collection, Labelling

4. What type of formal reports is an entry level technician required to write?

None

5. What two specific skills did you wish your entry level technicians had that they did not have?

Sample Container Use
Sample Collection
Chain-of-Custody
Knowledge of Use of MSDS Sheets
Sample Preservation

B. Please offer any additional comments we should consider in developing this curriculum.

COMMENTS: *Technician stated Chemistry was not required. A B.S. graduate would be trainable enough.*

Interviewer Name Al Guillen & Oscar Hinojosa Date 1-14-94

Specific Needs/Qualification Interview Protocol
Environmental Technology Study
(Laboratory Analysis and Environmental Sampling)

Respondent Name _____ Title *Lab Supervisor*

Organization Name *INDV - L1* Telephone _____

I. RESPONDENT'S BACKGROUND.

A. What is your job title/responsibility?

B. How much experience do you have in Laboratory Analysis and Environmental Sampling, and how long did you perform those duties? *8*

How long has it been since you performed or supervised these duties? _____

Presently doing it.

C. How many technicians do you supervise presently or are employed by the company you work for at your location? *8*

Supervise 8
Employed 25

II. ENTRY LEVEL ASSESSMENT.

A. If you NOW supervise or perform these specific duties of Environmental Technicians (Laboratory Analysis and Environmental Sampling), please respond to the following questions:

1. What are the specific analytical instruments an entry level technician needs to be able to operate?

Analyzer, PH Meter, Distillation Apparatus, Separatory funnel, Total Organic Carbon Analyzer, Visible Spectrophotometer, Ultra-Violet Spectrophotometer

2. What are the principal specific analytical procedures an entry level technician is expected to know and use?

   EPA Manual for water and waste water
   EPA Manual for solids
   Standard methods
   ASTM Manual

3. What are the principal QA/QC procedures an entry level technician is expected to know and use?

   Check samples, blank samples

4. What type of formal reports is an entry level technician required to write?

   Entry level technicians do not write formal reports. They need to and are required to keep full documentation on log book.

5. What two specific skills did you wish your entry level technicians had that they did not have?

   (BS Degree) Physical Measurements, distillation & volumetric pipefitting.

B. Please offer any additional comments we should consider in developing this curriculum.

COMMENTS: _____ *is on the steering of the Environmental (Field Lab Tech) for Brookhaven.*

Interviewer Name *Al Guillen* Date *1-10-94*

Specific Needs/Qualification Interview Protocol
Environmental Technology Study
(Laboratory Analysis and Environmental Sampling)

Respondent Name _____ Title *Environmental Lab Manager*

Organization Name *INDV - L2* Telephone _____

I. RESPONDENT'S BACKGROUND.

A. What is your job title/responsibility?

Chief of _____ *Houston Laboratory Branch*

B. How much experience do you have in Laboratory Analysis and Environmental Sampling, and how long did you perform those duties? *20 & yrs.*

How long has it been since you performed or supervised these duties? 5 yrs.

C. How many technicians do you supervise presently or are employed by the company you work for at your location? *25*

II. ENTRY LEVEL ASSESSMENT.

A. If you NOW supervise or perform these specific duties of Environmental Technicians (Laboratory Analysis and Environmental Sampling), please respond to the following questions:

1. What are the specific analytical instruments an entry level technician needs to be able to operate?

HPLC - Isocratic and Gradient Elution & Post Column Derivitization, Gel Permeation Chromatograph, Gas Chromatography - Programmed temperature and Purge and trap, Atomic Absorption Spectrograph, pH, Ion Selective-Electrode Specific Analysis, Micro-Tox LC- 50, GC/MS

2. What are the principal specific analytical procedures an entry level technician is expected to know and use?

   Compliance confirmation from eluent streams from water and wastewater, TCLPs, Alkalinity, Hardness, Thalates, PCBs, RCRA Compliance, Air Analysis.

3. What are the principal QA/QC procedures an entry level technician is expected to know and use?

   EPA guidelines, control tables, recovery data, standard deviation, QA/QC plan, Precision, Accuracy DATA Quality Objectives.

4. What type of formal reports is an entry level technician required to write?

   Notebook, Sample Forms, Memorandums.

5. What two specific skills did you wish your entry level technicians had that they did not have?

   Basic-Metric, weigh & measure, MSDS knowledge, Wet Chemistry Liquid Extractrons, BODs, CODs, Nutrient Analysis for soils , Water Hardness, Metal Analysis, Environmental Waste Treatment.

B. Please offer any additional comments we should consider in developing this curriculum. *Might certify technicians through TNRCC for certification for class licensing.*

COMMENTS: *Right-to-Know*
SOPs
Spill Contingency Planning - Environmental Overview H.S.
Laboratory Notebooks

Interviewer Name Al Guillen & Oscar Hinojosa 92 Date 1-11-94

ENVIRONMENTAL TECHNOLOGY
(Laboratory Analysis and Environmental Sampling)

APPENDIX D

Sample Population Lists with Respondents Noted:

1. Private (Independent) Laboratories
2. Manufacturers Outside Rio Grande Valley Area
3. Manufacturers in Rio Grande Valley Area

BEST COPY AVAILABLE

(Private Laboratories)

*ERMI Laboratories
200 West Belmont Drive
Dallas, TX 75002

Koch Engineering Co. Inc.
Personnel Representative
PO Box 8127
Wichita, Kansas 67208

Natioanal Environmental Testing
1548 Valwood Pkwy Suite 118
Carrollton, TX 75006

CPM Laboratory
1548 Valwood
Carrollton, TX 75006

*ICF Kaiser Engineers
750 N St Paul Ste 700
Dallas, TX 75201

Aero Testing Inc
4408-B McLean Rd
Dallas, TX 75211

Dallas Laboratories Inc
1323 Wall
Dallas, TX 75215

Scientech, Inc Laboratories
2105 Luna Rd.
Dallas, TX 75220

Betz Labs Inc
2222 Lonnecker Dr
Dallas, TX 75221

*Analytical Services of Texas
414 West Fork Drive
Arlington, TX 76012

Union Carbide
PO Box 3670
Bound Brook, N.J. 08805

Ermi Laboratory
PO Box 842
Allen, TX 75002

En Lab
PO Box 713
Denison, TX 75020

Gymnurs Laboratory
1601 N. Glenville #105
Dallas, TX 75081

Enclean Environmental Services
4925 Greenville Avenue, Suite 900
Dallas, TX 75206

Southwestern Laboratories Inc
2575 Lone Star
Dallas, TX 75212

V H Laboratories
2828 Martin Luther King Jr Blvd
Dallas, TX 75215

Hurst Metallurgical Research Laboratory
2111 W Euless Blvd
Euless, TX 76040

Spectro-Analytic
PO Box 998
Allen, TX 75002

Sunebelt Industrial Services
3801 Hulen Suite 108
Dallas, TX 75221

Oak Ridge National Lab
PO Box 2008
Oak Ridge, TN 37831-6384

Anachem Laboratory
8 Prestige Circle #104
Dallas, TX 75002

*Southern Spectrographic Lab
3608 Conflans
Irving, TX 75061

NDRC Laboratory
PO Box 612027
Richardson, TX 75081

OCM Test Laboratory Inc
1361 E. Pomona St.
Dallas, TX 75209

*Dallas Testing Laboratory
PO Box 15705
Dallas, TX 75215

ITEX Laboratory
4140 Overton Road
Dallas, TX 75216

Scott & White Enviromental Toxicology Lab
1140 E Pioneer Pkwy #304
Dallas, TX 75221

Dallas Laboratories
1323 Wall
Dallas, TX 75221

Pope Testing Laboratory
PO Box 903
Dallas, TX 75221

*Companies that responded to survey

(Private Laboratories)

Southwestern Laboratory
PO Box 224227
Dallas, TX 75222

*Cura Laboratory
2209 Wisconson #400
Dallas, TX 75229

EPC Engineering Resources Inc
9862 Plano Rd Suite 100
Dallas, TX 75238

Metco Environmental
16115 Dooley Rd
Dallas, TX 75244

Parmae Laboratories
7101 John W Carpenter Frwy
Dallas, TX 75247

*East Texas Testing Laboratory
1717 E. Erwin
Tyler, TX 75702

*Atomus Laboratory
PO Box 1227
Arlington, TX 76010

Talem Incorporated
PO Box 3270
FT Worth, TX 76113

*Scott & White Environmental
Toxicology Lab
600 S 25th Street
Temple, TX 76504

*Aqua Science-SK Laboratories
1122 S. Bryant Blvd
San Angelo, TX 76903

*Atech Associate Laboratory
11356 Mathis Avenue
Dallas, TX 75229

*Institute for Forensic Science
PO Box 35728
Dallas, TX 75235

*Materials Analysis Inc
10338 Miller RD
Dallas, TX 75238

Verichem Laboratories Inc
903 Business Pkwy
Dallas, TX 75081

Gutierrez Smouse Wilmut & Assoc Inc
11117 Shady Tr
Dallas, TX 75299

Angelina-Neches River Authority
PO Box 387
Lufkin, TX 75901

Toptech International Laboratory
409 Lilliard Road, #B
Arlington, TX 76012

Williams Testing Laboratory
2106 James Street
Denton, TX 76201

Central Texas Analytical Laboratory
8283 Bosque
Waco, TX 76702

Enviro Tech Labs
117 S A & M Avenue
San Angelo, TX 76901-3661

Maxim Engineering Lab
PO Box 59902
Dallas, TX 75229

Southern Flow
4011 Shilling
Dallas, TX 75237

ATCI
2100 N. Greenbolt Avenue, Suite 300
Richardson, TX 75082

*Armstrong Environmental
4747 Irving Blvd Suite 204
Dallas, TX 75247

Analab Corp.
Rt. 2 Box 176 W
Kilgore, TX 75662

T.E.S.T. Laboratory
307 East College
Nacogdoches, TX 75961

Heritage Environmental Services Inc.
4275 Little Road
Arlgton, TX 76016

TRAC Laboratory
PO Box 215
Denton, TX 76201

Marathon Power & Light
PO Box 8233
Waco, TX 76714

Winter J & Associates Forensic
340 S. 66
Houston, TX 77002

*Companies that responded to survey

(Private Laboratories)

APR Laboratories Inc
3323 Gulf Frwy
Houston, TX 77003

Houston Laboratories
340 S 66th
Houston, TX 77011

ChemTrusion
7115 Clinton Drive
Houston, TX 77020

Associated Testing Labs, Inc.
7103 Peerless
Houston, TX 77021

*NDRC Laboratories, Inc.
11155 S. Main
Houston, TX 77025

*City of Houston Health Dept. LA
1115 S. Braeswood Drive
Houston, TX 77030

Anacon Incorporated
730 FM 1959
Houston, TX 77034

*McBride Labs
7220 Langtry
Houston, TX 77040

*Envirotest Inc.
3902 Braxton Drive
Houston, TX 77063-6304

Precision Petroleum Labs, Inc.
3500 E T C Jester
Houston, TX 77051

Southwestern Laboratories, Inc.
222 Cavalcade
Houston, TX 77009

*MBA Laboratory
PO Box 9461
Houston, TX 77011

*Bryan Laboratory, Inc.
6919 Almeda Rd.
Houston, TX 77021

Edna Wood Laboratories, Inc.
4820 Old Spanish Trail
Houston, TX 77021

L-H Laboratory
PO Box 21222
Houston, TX 77026

Enseco Laboratory
1420 East North Belt #120
Houston, TX 77032

*Labtech Corporation
8181 Commerce Park
Houston, TX 77036

Aqua Terra
14655 Northwest Fwy
Houston, TX 77040

*Geochem Laboratories Inc.
1143-C Brittmoore
Houston, TX 77043

Consolidated Sciences
809 Tatar
Houston, TX 77052

Southwestern Laboratory
PO Box 8768
Houston, TX 77009

A & B Environmental Laboratory
1643 Federal Road
Houston, TX 77015

*Edna Wood Laboratory
4820 Old Spanish Trail
Houston, TX 77021

Omni Petroleum Services, Inc.
6955 Portwest
Houston, TX 77024

Quality Labs of Texas
9650-B Clinton Dr.
Houston, TX 77029

*Mercury Environmental Services
1604 S. Shaver
Pasedena, TX 77502

Muniservices Laboratory
8181 Commerce Park #726
Houston, TX 77036

Water Quality Services
17459 Village Green Drive
Houston, TX 77040

Von Analytical Laboratories
10801 Hammerly
Houston, TX 77043

A & M Technical Services
3208 N IH 45
Houston, TX 77052

*Companies that responded to survey

(Private Laboratories)

OMNI Testing Laboratories
4302 Dayco
Houston, TX 77052

M.B.A. Labs
340 S. 66th
Houston, TX 77052

Chemical Research & Licensing Co
10100 Bay Area Blvd
Pasadena, TX 77058

HIH Laboratory Inc.
900 Gemini
Houston, TX 77058

Institute for Research Inc.
8330 Westglen
Houston, TX 77063

Environdyne Inc.
9909 S Gessner Drive
Houston, TX 77071

Devas Laboratories
7800 Bissonnet
Houston, TX 77074

Xenco Laboratories
11381 Meadowsglen Suite L
Houston, TX 77082

ACS Laboratory
16203 Park Row #100
Houston, TX 77084

*Efeh & Assoc. Laboratory
10919 Sagewind Drive
Houston, TX 77089

Betz Laboratories Inc.
9669 Grogans Mill Road
Houston, TX 77052

*Petroleum Testing Service, Inc.
4350 W. 12th St.
Houston, TX 77055

Haliburton - NUS
Director Human Resources
900 Gemini Avenue
Houston, TX 77058

Heritage Environmental Services
18333 Egret Bay Blvd
Houston, TX 77058

Southwest Research Institute-Houston
7500 San Felipe
Houston, TX 77063

*Analytical Chromatography Support
11411 Cliffgate
Houston, TX 77072

*Conam Inspection Inc.
6106 Rookin
Houston, TX 77074

*On-Site Analytical Laboratory
11391 Meadowglen #C
Houston, TX 77082

*Hanby Laboratory
4400 South Wayside #107
Houston, TX 77087

North Water District Laboratory
301 Wells Fargo Drive #6
Houston, TX 77090

Griffin Remediation Services-Southern Inc
1717 East Loop North
Houston, TX 77052

*Environmental Sampling Supply, Inc.
5817 Westview
Houston, TX 77055

*Micro Air of Texas, Inc.
1052 Hercules
Houston, TX 77058

Keystone Environmental Lab
is now *Chester Lab
8300 West Park
Houston, TX 77063

*Martel, Inc.
250 Meadowfern
Houston, TX 77067

International Environmental Services
4700 S. Kirkwood
Houston, TX 77072

*Fugro-McClelland
6100 Hillcroft
Houston, TX 77081

Aqua Analytical Laboratory Services
16203 Parker Row, Suite 110
Houston, TX 77084

Southwest Environmental Laboratory
PO Box 487
Houston, TX 77088

National Environmental Testing Inc.
9800 Northwest Frwy
Houston, TX 77092

*Companies that responded to survey

(Private Laboratories)

*Gulf States Analytical
5450 Northwest Central Drive 110
Houston, TX 77092

M E E C Co Analytical Services, Inc.
3801 Kirby Drive
Houston, TX 77098

Core Laboratories Division of Western Atlas
PO Box 14072
Houston, TX 77251

Miles Corp.
PO Box 87220
Houston, TX 77287-7220

Aqua Analytical Laboratory
PO Box 6438
Kingwood, TX 77325

Betz Laboratories
9669 Grogan's Mill Road
The Woodlands, TX 77380

*Ethyl Corporation
PO Box 472
Pasadena, TX 77501

PSI Laboratory
6913 Hwy 225
Deer Park, TX 77536

SGS Lab
1201 W. 8th Street
Deer Park, TX 77536

BASF
602 Copper Road
Freeport, TX 77541

Environmental Science & Engineers
2644 S Sherwood Forest Blvd, Suite 200
Baton Rouge, LA 70816

Ecology Technology Laboratory
PO Box 23326
Houston, TX 77228

Southern Petroleum Laboratory
PO Box 20807
Houston, TX 77255

Polyhedron Laboratories, Inc.
Post Office Box 11669
Houston, TX 77293

*Eastex Environmental Laboratory
PO Box 859
Coldspring, TX 77331

SLT-North American
200 South Trade Center Parkway
Contoe, TX 77385

Bay Cove Laboratory
308 Narcille
Baytown, TX 77520

Quantum Chemical - USA
PO Drawer D
Deer Park, TX 77536

APR Laboratory
PO Box 1188
Dickinson, TX 77539

*ECM Laboratory
432 Forest Drive
Lake Jackson, TX 77566

Analytikem
2925 Richmond Avenue
Houston, TX 77098

Aer-Aqua Laboratory
PO Box 300527
Houston, TX 77230

Von Analytical Laboratory
PO Box 841624
Houston, TX 77284

Texaco Chemical Co.
PO Box 219
Conroe, TX 77305

TRA Laboratory-Lake Livingston
PO Box 360
Livingston, TX 77351

*Triangle Laboratory
12823 Parkone Drive
Sugarland, TX 77478

*Lyondell Petro. Co.
8290 Sheldon Road
Channelview, TX 77530-0777

*Solvay American
PO Box 1000
Deer Park, TX 77536

*Dow Chemical-Texas OPNS
Building B, 460
Freeport, TX 77541 77541

Analytical Testing Company
401 North 11th Street
Laporte, TX 77571

*Companies that responded to survey

(Private Laboratories)

*Environ Express Laboratory
401 North 11th Street
La Porte, TX 77571

Texas Environmental Services LA
1045 Boston Avenue
Netherland, TX 77627

Lower Neches Valley Authority
PO Box 3464
Beaumont, TX 77704

*Soil Analytical Services
PO Box 10360
College Station, TX 77842

PPG Industries
Senior Opns Engineer
PO Box 946
LaPorte, TX 77851

*Upper Guadalupe River Authority
PO Box 1278
Kerrville, TX 78029

Clean Soils International Inc
1100 NW Loop 410
San Antonio, TX 78209

*Trinity Testing Laboratories Inc.
1305 Garcia
Laredo, TX 78040

Geo-Test Services
10427 Perrin Beitel
San Antonio, TX 78217

Scott & White Environmental Toxicology
2391 N E Loop 410 #112
San Antonio, TX 78217

Terra Laboratories
2525 South Shore Blvd.
League City, TX 77573

*Sabine River Authority
PO Box 579
Orange, TX 77631

Mega Laboratory
PO Box 3486
Bryan, TX 77801

International Laboratories
11183 S. Hwy 30
College Station, TX 77845

Formosa Plastics
PO Drawer 659
Por Lavaca, TX 77979

Guadalupe-Blanco River Authority
PO Box 271
Seguin, TX 78155

Chemron, Inc.
431 Isom Road
San Antonio, TX 78216

Pollution Control Services
435 Isom Rd Suite 228
San Antonio, TX 78216

Southwestern Laboratories Inc.
2435 Boardwalk
San Antonio, TX 78217

Morrison Knudsen Corporation
2446 Ceegee
San Antonio, TX 78217

*Union Carbide
PO Box 471
Texas City, TX 77592

Source One Environmental Lab
3145 South 11th St.
Beaumont, TX 77704

*Glenwood Laboratories
5018 North Hwy. 288
Clute, TX 77831

Inter Mountain Laboratory
3304 Longmire
College Station, TX 77845

*B & P Chemicals
PO Box 659
Port Lavaca, TX 77979

*San Antonio River Authority Lab
PO Box 9284
San Antonio, TX 78204

American Testing & Technical Services
424 W Nakoma
San Antonio, TX 78216

Environmental Support Services
3200 Nacogdoches
San Antonio, TX 78217

*Geotech & CMT IHS
2405 Boardwalk
San Antonio, TX 78217

San Antonio Testing Lab
1610 Laredo Street
San Antonio, TX 78218

*Companies that responded to survey

(Private Laboratories)

Operational Technologies Corp
4100 NW Loop 410
San Antonio, TX 78218

*Southwest Research Institute
Fuels and Lubricants Laboratory
PO Drawer 2851
San Antonio, TX 78228

Petroleum Environmental Services
7218 Polar Bear
San Antonio, TX 78238

American Testing Engineering Corp
12053 Starcrest Dr.
San Antonio, TX 78247

Petro-Global Consultants Inc
2389 Northwest Military Highway
San Antonio, TX 78265

*Celanese
PO Box 428
Bishop, TX 78343

Gulf Coast Testing Laboratory
1205 N. Tancahua
Corpus Christi, TX 78401

*Jordan Laboratory
PO Box 2552
Corpus Christi, TX 78403

Jordan Laboratories Inc.
842 Cantwell Drive
Corpus Christi, TX 78408

EmTech Environmental Services Inc.
7889 Leopard Street
Corpus Christi, TX 78409

Petroleum Performance Inc
5120 Service Center Dr
San Antonio, TX 78218

Pollution Control Laboratory
131 Bandera Road
San Antonio, TX 78228

Southwestern Laboratories Inc
1850 Grandstand Dr
San Antonio, TX 78238

*Bryant-Lee Associates
11950 Starcrest Drive
San Antonio, TX 78247

*Southwest Research Institute
PO Box 28510
San Antonio, TX 78284

Jones Pump Company
1113 S 6th
Kingsville, TX 78363

*CSI Environmental Laboratory
405 N Tancahua
Corpus Christi, TX 78401

CC Pump Service
3827 Baldwin
Corpus Christi, TX 78404

Petroleum Testing Lab
4145 Russell Drive
Corpus Christi, TX 78408

Good Earth Environmental Services
3817 Castle Ridge Drive
Corpus Christi, TX 78410

Analytical Services Laboratory
4839 Space Center
San Antonio, TX 78218

Olmos Environmental Services
7054 Snow Flake
San Antonio, TX 78238

San Antonio Air Logistic Center
Directorate of Aerospace Fuel
Kelly Air Force Base, TX 78241

Raba Kistner Laboratory
PO Box 690287
San Antonio, TX 78249

FESCO Inc.
1408 E Main
Alice, TX 78332

Gulf Coast Testing Laboratory
1205 N. Tancahua
Corpus Christi, TX 78401

Susser Environmental Services
950 1/2 E Port Avenue
Corpus Christi, TX 78401

*Core Laboratory
1733 Padre Isl Drive
Corpus Christi, TX 78408

LDAR Services
PO Box 9610
Corpus Christi, TX 78469

Southwest Environmental Services Inc.
7330 Greenwood
Corpus Christi, TX 78415

*Companies that responded to survey

(Private Laboratories)

*Valero Refining Company
PO Box 9370
Corpus Christi, TX 78469

Fox Laboratory
PO Box 346
Harlingen, TX 78550

Edwards Aquifer Research Center
San Marcos, TX 78666-4616

Peek & Ball Investigations
55 N IH 35
Austin, TX 78702

Applied Environmental Technolgies
6014 Techni Center Drive
Austin, TX 78721

*TRI Environmental
9063 Bee Caves Road
Austin, TX 78733

IT Corporation
5307 Industrial Oaks Blvd. #160
Austin, TX 78735

*Sematech
Personnel Director
2706 Montopolis Drive
Austin, TX 78741

*Capitol Environmental Services
795 Oakdale Drive
Austin, TX 78745

*Hall Southwest Corporation
505 East Huntland Drive
Austin, TX 78752

American Chrome & Chemical
PO Box 9912
Corpus Christi, TX 78469

Applied Microbial Technology
40105-A Industrial Park Circle
Georgetown, TX 78626

*Openheimer Laboratories
1206 W. 4th Street
Austin, TX 78701

Radian Corporation
PO Box 201088
Austin, TX 78720-1088

*Combest Geoscience
7122 Wood Hollow Drive
Austin, TX 78731

Paul Price & Associates
PO Box 23207
1135 W. 6th Street
Austin, TX 78735

Alpha Environmental Inc.
7748 Hwy 290 W
Austin, TX 78736

Southwestern Laboratories
4150 Freidrich Lane
Austin, TX 78744

Hazcorp Environmental
7004 Bee Cave Road
Austin, TX 78746

Tank Systems Inc.
505 W Yager Lane
Austin, TX 78753

*Southwestern Refinery Co.
Division Kerr-McGee
PO Box 9217
Corpus Christi, TX 78469

Sizemore Laboratory
2011 Lamar Drive
Round Rock, TX 78664

American Energy & Environmental Engineering
507 West Avenue
Austin, TX 78701

Applied Environmental Technologies
6014 Techni Center Drive
Austin, TX 78721

Texas Research Inst. Laboratory
9063 Bee Caves Road
Austin, TX 78733

International Technology Corp.
5307 Industrial Oaks
Austin, TX 78735

Community Environmental Services
2101 S IH 35
Austin, TX 78741

*Analysis Laboratory
PO Box 5083
4221 Friedrich Lane #190
Austin, TX 78744

*GEO Technical-Environmental Laboratories Inc.
7801 N Lamar Suite 180 E
Austin, TX 78752

EnClean
8403 Cross Park Drive Suite 3D
Austin, TX 78754

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*Companies that responded to survey

(Private Laboratories)

*Net Lab
2621 Ridgepoint Drive
Austin, TX 78758

Tracor Test Services
6500 Tracor Lane
Austin, TX 78767

*LCRA Laboratory
PO Box 220
3600 Lake Austin Blvd.
Austin, TX 78767

*Dyess Testing Laboratory Inc
506 S. Lipscomb
Amarillo, Tx 79105

*Environmental Laboratories Inc
812 W. 9th Av
Amarillo, Tx 79105

*LCC Institute for Water Research
5601 W. 19th Street
Lubbock, TX 79407

*Anviron Laboratory
Drawer N, HSU Station
Abilene, TX 79698

Mobile Analytical Laboratory
2800 Westover Stret
Odessa, TX 79767

Air Soil & Water Environmental
1615 Arizona Av
El Paso, TX 79902

Allo-Tech Lab
7365 Remcon Cir
El Paso, TX 79912

*Center for Research in Water
109100 Burnett Rd.
Austin, TX 78758-4497

*Burcham Environmental Service
1100 N Meadows Drive
Austin, TX 78767

TRC Environmental Corporation
1515 S Cap
Austin, TX 78767

UNC Analytical Services
6900 IH 40 West
Amarillom TX 79105

Chem-Lab Services
6420 River Road
Amarillo, TX 79108

A & L Plains Laboratory
PO Box 1590
Lubbock, TX 79408

*Martin Water Laboratory
709 W. Indiana
Midland, TX 79701

Probe Laboratory
1804 Texas Avenue
El Paso, TX 79901

*Applied Environmental Services
1111 Myrtle Av
El Paso, TX 79910

Assaigai Analytical Labs, Inc.
3711 Admiral, Suite C
El Paso, TX 79925

Environmental Monitoring Service
12731 Research Blvd
Austin, TX 78759

Texas Industrial Waste Control Inc.
3500 Sunrise Road
Austin, TX 78767

High Plains Laboratory
1502 West Park Avenue
Hereford, TX 79054

Environ
812 W. 9th
Amarillo, Tx 79105

*Enreco Laboratories Group
6661-C Canyon Dr
Amarillo, Tx 79110

Cardinal Laboratory
2110 North Willis
Abilene, TX 79603

*Southwestern Laboratory
PO Box 2150
Midland, TX 79702

*Westech Laboratories
10737 Gateway West
El Paso, TX 79902

Complete Environmental Services
7307 Remcon Circle Suite 101
El Paso, TX 79912

Archana Laboratories
1140 Airway Blvd
El Paso, TX 79925

102 *Companies that responded to survey

(Private Laboratories)

Sunbelt Laboratories
1410 Gail Borden Place
El Paso, TX 79935

*Phelps-Dodge Refining
PO Box 20001
El Paso, TX 79998

*Companies that responded to survey

(Manufacturers O. .ide RGV Area)

Victoreen Inc.
6000 Cochran Road
Cleviand, OH 44139

*Graphic Technology Inc
301 Gardner Dr
Industrial Airport, KS 66031

Merlin Inc
2101 E 32nd
Tulsa, OK 74105

Forney Intl Inc.
PO Box 189
Addison, TX 75001

SGS-Thomson Microelectronics Inc.
1310 Electronic Drive
Carrollton, TX 75006

SSDC
2151 Hutton
Carollton, TX 75006

Optek Technology Inc.
1215 W Crosby Road
Carrollton, TX 75006

Schnee-Morehead Inc.
111 N Nursery Rd, Box 1305
Irving, TX 75015-1305

Boeing Electronics-Irving
3131 W Story Rd, Box 152707
Irving, TX 75015-2707

Hitachi Semiconductor Inc
6321 E Campus Circle Dr, Box 167928
Irving, TX 75016

Lone Star Corrugated Container Co.
700 N Wildwood, Box 177357
Irving, TX 75017-7357

Denison Industries, Inc.
5511 Fielder, Box 1459
Denison, TX 75021-1459

Hutson Industries
1000 Hutson Dr, Box 90
Frisco, TX 75034

*GNB Inc.
7471 S 5th, Box 250
Frisco, TX 75034

Trecor Semiconductors
1801 Hurd Drive
Irving, TX 75038

Micropac Industries Inc.
905 E Walnut
Garland, TX 75040

Sherwin-Williams Co
2802 W Miller Rd
Garland, TX 75041

Union Carbide Corp
2326 Lonnecker Dr
Garland, TX 75041-1296

*The Valspar Corp
701 Shiloh Road
Garland, TX 75042

Nova Magnetics Inc
1101 E Walnut
Garland, TX 75042

Sureguard Inc
2350 114th
Grand Prarie, Tx 75050

Interturbine Dallas
1177 Great Southwest Pkwy
Grand Prairie, TX 75050

Score Group Inc
924 Ave J East
Grand Prairie, TX 75050

Texstar Inc
802 Ave J East, Box 534036
Grand Prarie, TX 75053

Mohawk Laboratories
2730 Carl Rd
Irving, TX 75062

Homco Inc
1400 Lavon Dr
McKinney, TX 75069

Primo Microphones Inc.
1805 Couch Drive
McKinney, TX 75069

Luminator
1200 E Plano Pkwy
Plano, TX 75074

Honeywell Inc
830 E Arapaho Rd
Richardson, TX 75081

BSM Computer
1355 Glenville Avenue
Richardson, TX 75081

***Companies that responded to survey**

(Manufacturers Outside RGV Area)

IRI Intl Corp
PO Box 1101
Pampa, TX 79065

Cooper Industries Inc.
1901 Farmers Avenue, Rte 5 Box 6
Amarillo, TX 79118

El Rey Salt Co Inc
2313 Broadway
Lubbock, TX 79401

Carroll Welding Supply Inc
3108 Plum, Box 1857
Abilene, TX 79604

Amoco Production Co
North Cowden Field, Box 12550
Odessa, TX 79768-2550

Baxter Healthcare Corp
1 Butterfield Trail Blvd
El Paso, TX 79906

Stone Container Corp
7350 Stiles Dr
El Paso, TX 79915

Handgards Inc
901 Hawkins Blvd, Box 26669
El Paso, TX 79926

Asarco Inc.
2301 W Paisano Dr Box 1111
El Paso, TX 79999

Hoechst Celanese Chemical Group
PO Box 937
Pampa, TX 79066-0937

*Asarco Inc
Hwy 136 NE, Box 30200
Amarillo, TX 79120

Auto-Chlor Syst of West Texas Inc
1310 S Treadway
Abilene, TX 79602

Fiberflex Inc.
615 Bethel Lane, Box 6044
Big Spring, TX 79720

Permian Brine Sales Inc
6067 W 10th
Odessa, TX 79763

Becton Dickinson Microbiology
20 Founders Blvd
El Paso, TX 79906

American Minerals Inc
3666 Doniphan Dr
El Paso, TX 79922

El Paso Wire Inc.
201 Inglewood Drive
El Paso, TX 79927

*Arco Chemical Co
2502 Sheldon Road
Channelview TX 77530

K-Lan Plastics Inc
1205-1207 NW 1st, Box 5663
Amarillo, TX 79117

Mason & Hanger-Silas Mason Co Inc.
NE of city, Box 30020
Amarillo, TX 79177

Pride Refining Inc.
Hwy 277 N Ind Dist, Box 3237
Abilene, TX 79604

*DynaGen Inc
2000 E Pool Rd, Box 2032
Odessa, TX 79760

*Del Norte Chemical & Supply Co
3011 Durazno Ave
El Paso, TX 79905

Hoover Co.
7850 Hoover Ave
El Paso, TX 79912

Taylor Simpkins Inc
1235 Tower Trail, Box 3275
El Paso, TX 79923-3275

*Texas Magnet Wire
9541 Plaza Circle
El Paso, TX 79927-2004

*Shell Development Co.
PO Box 1380
Houston, TX 77251

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*Companies that responded to survey

(Manufacturers Outside RGV Area)

*Hitox Corp of America
722 Burleson, Box 2544
Corpus Christi, TX 78403

CITGO Petroleum Corp
1801 Nueces Bay Blvd, Box 9176
Corpus Christi, TX 78469

Carlingswitch Inc.
3734 International Blvd
Brownsville, TX 78521

Advanced Custom Molders
107 ACM Way
Georgetown, TX 78626-7507

*McNeil Consumer Products Co
4001 IH 35 N
Round Rock, TX 78664

Thermon Mfg Co & Thermon Industries
100 Thermon Drive, Box 609
San Marcos, TX 78667

American Microelectronics Inc.
1611 Headway Cir Bldg 3, Box 140767
Austin, TX 78714

3M Telecom System Group
6801 River Pl Blvd
Austin, TX 78726-9000

Halinco Skin Care Products Inc
5355 Burnet Rd, Box 9405
Austin, TX 78766

Huber, J M, Corp
Hwy 136 at FM 1559, Box 2831
Borger, TX 79008-2831

Horton Automatics
4242 Baldwin
Corpus Christi, TX 78405

*American Chrome & Chemicals Inc
Buddy Lawrence Dr, Box 9912
Corpus Christi, TX 78469

*Jerrold Communications
4694 Coffeeport Rd, Box 4520
Brownsville, TX 78523

Gore, WL, & Assoc Inc
7811 Burleson-Manor Rd, Drawer Q
Manor, TX 78653

Tellabs (Texas) Inc
601 Jeffrey Way
Round Rock, TX 78664

*Westinghouse Electric Corp
PO Box 1000
Round Rock, TX 78680-1000

*Motorola Inc.
3501 Ed Bluestein Blvd
Austin, TX 78721

*Micro-Bac Intl Inc
9607 Gray Blvd
Austin, Tx 78758

Utex Industies Inc.
6058 Utex Drive, Box 901
Weimar, TX 78962

*US Bureau of Mines
Exell Helium Plt, Box 100
Masterson, TX 79058

*OxyChem Petrochemicals
1501 McKenzie Road, Box 10940
Corpus Christi, TX 78460

Sun Splash
3149 Crestwater, Box 72343
Corpus Christi, TX 78472-2343

Vera Products Inc
2809 E Grimes, Box 2624
Harlingen, TX 78551

*Gould Inc
2410 Hwy 281 N, Box 729
Marble Falls, TX 78654

Wide-Lite Corp
500 Wonder World Drive
San Marcos, TX 78666

Air Products & Chemicals Inc
5341 Industrial Oaks Blvd, Box 90339
Autin, TX 78709-0339

Tracor Aerospace Inc.
6500 Tracor Lane
Austin, TX 78725-2070

Lockheed Missiles & Space Co
6800 Burleson Road, Box 17100
Austin, TX 78760

Phillips 66 Co
PO Box 968
Borger, TX 79008

Cabot Corp
PO Box 5001
Pampa, TX 79065

*Companies that responded to survey

(Manufacturers Outside RGV Area)

Morgan Building & Spa Mfg Co
FM 318, Drawer D
Halletsville, TX 77964

*Amtopp Corp
FM 1593
Lolita, TX 77971

Formosa Plastics Corp Texas
101 Formosa Dr, Box 400
Point Comfort, TX 77978

Carbide/Graphite Group
PO Box 192
Port Lavaca, TX 77979

Union Carbide Chemicals & Plastics
PO Box 186
Port Lavaca, TX 77979

Posso Corp
200 Holdsworth Dr, Box 727
Kerrville, TX 78029

Sony Magnetic products Inc
5819 Riverside Drive Ste 100
Laredo, TX 78041

Trans-Jeff Chemical Corp
Hwy 16, Box 295
Tilden, TX 78072

Rio Grande Resources Corp
4 mi E of city on FM 81, Box 1000
Hobson, TX 78117

The Coleman Co Inc
766 Fm 306
New Braunfels, TX 78130

Xerxes Corp
2001 Proform Rd
Seguin, TX 78155

Motorola Inc.
3740 N Austin
Seguin, TX 78155

Newell Industries Inc.
530 Steves Avenue, Box 10629
San Antonio, TX 78210

Industrial Lubricants Co.
434 Riverside Drive, Box 10290
San Antonio, TX 78210

KO Steel Co.
3700 Pitluk Ave, Drawer V
San Antonio, TX 78211

Jewett Mfg Corp
5110 Service Center Dr
San Antonio, TX 78218

Sani-Fresh Intl
4702 Goldfield Drive
San Antonio, TX 78218

*Textek Plastics Inc
9800 W Commerce
San Antonio, TX 78227

Standard Indutries
Nelson Rd & Reliable Dr, Box 27500
San Antonio, TX 78227

Power Controls Corp
1067 Bandera Rd
San Antonio, TX 78228

Media Recovery Inc.
12000 Crown Point
San Antonio, TX 78233

*Signtech USA Inc.
4669 Hwy 90 W
San Antonio, TX 78237

Noah Tecnologies Corp
7001 Fairgrounds Pkwy
San Antonio, TX 78238

Augat Automotive Inc
5903 Farinon
San Antonio, TX 78249

*Harris Corp
5727 Farinon Drive
San Antonio, TX 78249

DPT Laboratories Inc
307 E Josephine, Box 1659
San Antonio, TX 78296

Aker Gulf Marine
PO Box M
Aransas Pass, TX 78336

Hoechst Celanese Engineering Plastics Div
Hwy 77, Box 428
Bishop, TX 78343

*Occidental Chemical Corp
Hwy 361, Drawer CC
Ingleside, TX 78362

Du Pont de Nemours, E I & Co
Hwy 361, Box JJ
Ingleside, TX 78362

***Companies that responded to survey**

(Manufacturers Outside RGV Area)

Schenectady Chemicals Inc.
702 FM 523, Box 2830
Freeport, TX 77541

*Plastipak Packaging Inc
222 Kerry, Box 1145
Highlands, TX 77562

Air Products Mfg Co
10202 Strang Rd
La Porte, TX 77571-9721

*Amoco Oil Co
2401 5th Ave S, Box 401
Texas City, TX 77592

Marathon Oil Co
1320 Loop 197 S, Box 1191
Texas City, TX 77592-1191

Huber, JM, Corp
6522 IH 10 W
Orange, TX 77630

U S Intec Inc
1212 Brai Drive, Box 2845
Port Arthur, TX 77643

*Mobil Oil Corp
PO Box 3311
Beaumont, TX 77704

Sanitary Supply Co Inc
6790 College, Box 5408
Beaumont, TX 77706

Goodyear Tire & Rubber Co
PO Box 26003
Beaumont, TX 77720

United States Gypsum Co
1201 Mayo Shell Rd, Box 525
Galena Park, TX 77547

Tri-Sen Systems Inc.
4916 FM 1765
La Marque, TX 77568

Pauluhn Electric Mfg Co
1616 N Main, Box 53
Pearland, TX 77581

Sterling Chemicals Inc.
201 Bay St S, Box 1311
Texas City, TX 77592

Grumman Houston Corp
12130 Old Galveston Road
Webster, TX 77598

Equitable Bago Co Inc
13th & Front Sts
Orange, TX 77631-5001

*Texaco Chemical Co
6001 Hwy 366
Port Neches, TX 77651

Olin Corp
1400 Olin Rd, Box 30
Beaumont, TX 77704

Metalforms Inc.
PO Box 20118
Beaumont, TX 77720

Norton Chemical Process Products
1500 Independence Blvd
Bryan, TX 77803

American Plant Food Corp
903 Mayo Shell Road, Box 584
Galena Park, TX 77547

*PPG Industries Inc
1901 Ave H, Box 995
La Porte, Tx 77571

Gulf States Asphalt Co Inc.
300 Christy Pl,
South Houston, TX 77587

ISP Technologies Inc.
Hwy 146 & Industrial Rd, Box 2141
Texas City, TX 77592

Inland-Orange Inc
Old Hwy 87, Box 2500
Orange, TX 77630

Chevron USA Products Co.
PO Box 701
Port Arthur, TX 77641

Reagent Chemical & Research Inc
PO Box 998
Port Neches, TX 77651-0998

Sandoz Crop Protection Corp
W Port Arthur Rd, Rte 4 Box 327
Beaumont, TX 77705

Mabry Foundry Inc of Beaumont
695 Industry Rd, Box 21777
Beaumont, TX 77720

Big Tree Industrial Gas Inc
Old Bloomington Rd, Box 1937
Victoria, TX 77902

*Companies that responded to survey

(Manufacturers Outside RGV Area)

*Natural Gas Pipeline Co
PO Box 1139
New Caney, TX 77357

Texas Brine Corp
Rte 1 Box 144-D
Bay City, TX 77414

*Naico Chemical Co
7701 Hwy 90A, Box 87
Sugar Land, TX 77487-0087

ECI Building Components Inc.
13410 Murphy Road, Box 968
Stafford, TX 77497-0968

*Ethyl Corp
1000 N South St, Box 472
Pasadena, TX 77501

*Dixie Chemical CO Inc
10701 Bay Area Blvd
Pasadena, TX 77507

Exxon Chemical Americas
5000 Bayway Drive, Box 4004
Baytown, TX 77520-4004

Tex-Trude
2001 Sheldon Rd, Box 58
Channelview, TX 77530

Expo Wire Co
PO Box 1620
Dayton, TX 77535

Shell Oil Co
Hwy 225, Box 100
Deer Park, TX 77536

Dicar Inc
1302 S Cherry
Tomball, TX 77375

Cooper Oil Tool Div
126 Collins Road, Box 396
Richmond, TX 77469

International Switchboard Corp
730 Sartartia Rd, Box 2001
Sugar Land, TX 77487-2001

Simpson Pasadena Paper Co
N Shaver St, PO Box 872
Pasadena, TX 77501

Air Products Mfg Co
1423 Hwy 225, Box 3326
Pasadena, TX 77506-3326

Amoco Chemical Co
Chocolate Bayou & FM 2004, Box 1488
Alvin, TX 77511

Chevron Chemical Co
9500 IH 10, Box 509
Baytown, TX 77522

KMCO Inc
16503 Ramsey Rd
Crosby, TX 77532

OxyChem Inc
Tidal Rd, Box 500
Deer Park, TX 77536

Mineral Research & Development Corp
302 Midway Rd, Drawer FF
Freeport, TX 77541

B & E Services
1610 Woodstead, Ct Ste 470
The Woodlands, TX 77380

*Quanex Corp
Spur 529 & Scott Road, Box 952
Rosenberg, TX 77471

Trans Chem Inc
5354 E 1st, Box 951
Katy, TX 77492

Mobil Mining & Minerals Co
Jackson Rd & 1st St, Box 3447
Pasadena, TX 77501

*Lyondell Polymers Corp
9802 Fairmont Pkwy
Pasadena, TX 77507

Western Mfg
1001 Loop 35 E, Box 710
Alvin, TX 77512

Exxon Co U S A
2800 Decker Dr, Box 3950
Baytown, TX 77522-3950

Baker Performance Chemicals Inc
5 mi W of city on Hwy 90, Box 1590
Dayton, TX 77535

Lubrizol Petroleum Chemicals Co
#41 Tidal Road, Box 158
Deer Park, TX 77536

Win-Way Inc
615 W 2nd, Drawer GG
Freeport, TX 77541

*Companies that responded to survey

(Manufacturers Outside RGV Area)

The Blood Center
1400 La Concha
Houston, TX 77054

Meyer Industries
8700 Fairbands N Houston Rd
Houston, TX 77064

Daniel Industries Inc.
19203 Hempstead Hwy
Houston, TX 77065

Val-Tex
10600 Fallstone Road
Houston, TX 77099

Winkler Products Inc
1903 Tellepsen, Box 266526
Houston, TX 77207

duPont de Nemours, E I, & Co
PO Box 4413, Room #MA 2054
Houston, TX 77210

International Paint Co
6001 Antoine Dr, Box 4806
Houston, TX 77210-4806

Brown & Root Marine
14035 Industrial Road, Box 9807
Houston, TX 77213

ISK Biotech Corp
2239 Haden Rd, Box 9637
Houston, TX 77213

Quality Tubing Inc.
10303 Sheldon Road, Box 9819
Houston, TX 77213

*Powell Electric Mfg Co.
8550 Mosely, Box 12818
Houston, TX 77217-2818

*Lighthouse of Houston
3530 W Dallas, Box 134035
Houston, TX 77219

*Furon Metallic Gasket Div
1977 Kindred, Box 15639
Houston, TX 77220

Ivy Steel & Wire
6933 Clinton, Box 15633
Houston, TX 77220

Igloo Products Corp
PO Box19322
Houston, TX 77224-9322

Texberry Container Corp
6040 Donoho, Box 330367
Houston, TX 77233

NSSI
5711 Etheridge, Box 34042
Houston, TX 77234

Baylor Co
PO Box 36326
Houston, TX 77236

Biotics Research Corp
PO Box 36888
Houston, TX 77236

Telxon Corp
7280 Wynnwood, Box 7478
Houston, TX 77248

Ellwood Texas Forge Co.
12500 Amelia, Box 1477
Houston, TX 77251

Stewart & Stevenson Services Inc.
4516 Harrisburg, Box 1637
Houston, TX 77251-1637

Daniel Industries Inc
9753 Pine Lake Dr, Box 55435
Houston, TX 77255

St. Joe Container
1300 N Post Oak Road, Box 55625
Houston, TX 77255

*Hoechst Celanese Chemical Group
PO Box 58190
Houston, TX 77258-0190

*Goodyear Tire & Rubber Co
2000 Goodyear Dr, Box 5397
Houston, TX 77262

CSA Ltd Inc.
16212 FM 149, Box 690347
Houston, TX 77269-0347

Texacraft Outdoor Furnishings
5610 Parkersburg Dr, Box 741558
Houston, TX 77274-1558

Utex Industries Inc
10810 Old Katy Rd, Box 79227
Houston, TX 77279

Maverick Tube Corp
PO Box 659
Conroe, TX 77305

*Companies that responded to survey

(Manufacturers Outside RGV Area)

Quail Plastics
3348 Industrial Dr, Box 1391
Wichita Falls, TX 76307

*Hexcel Corp
338 N Pennsylvania Ave
Graham, TX 76450

*Mobil Chemical Co
3000 Pegasus Dr, Box 6119
Temple, TX 76503-6119

Frazier & Frazier Industries Inc.
S 1st Street, Box 279
Coolidge, TX 76635

*Hercules Inc.
1101 Johnson Drive, Box 548
McGregor, TX 76657

Coastal Product & Chemicals and Alcoa-Costal Chemicals
1100 Louisiana Ste 3160
Houston, TX 77002-5217

Northwestern Steel & Wire Co
1755 Federal Road
Houston, TX 77015

Plastic Distributing Corp of Texas
700-701 Turkey
Houston, TX 77020

Quality Electric Steel Castings Inc.
252 McCarty Drive
Houston, TX 77029

Simpro Inc
4949 Windfern Dr
Houston, TX 77041

Grace, W R, & Co-Conn
1301 W Magnolia
Iowa Park, TX 76367

Delta Centrifulgal Corp
3402 Center, Box 1043
Temple, TX 76502

A M Bio Techniques Inc
101 Greenbrier, Box 873
Belton, TX 76513

Hobbs Industries
1000 Hwy 14 N, Box 640
Groesbeck, TX 76642

*Barry of San Angelo
2800 Loop 306
San Angelo, TX 76904

Goodman Mfg Corp
1501 Seamist
Houston, TX 77008

Texas Aluminum Industries
2900 Patio Drive
Houston, TX 77017

Russel-Stanley Southwest Inc
4004 Homestead Rd
Houston, TX 77028

*Exxon Chemical Co
8230 Stedman
Houston, TX 77029-3999

Specialty Products & Equipment Inc
12275 Robin Blvd
Houston, TX 77045

Appleton Electric
2150 South Loop
Stephenville, TX 76401

Ralph Wilson Plastics Co
600 General Bruce Dr
Temple, TX 76503

*Aluminum Co of America
PO Box 472
Rockdale, TX 76567

Cercon
201 Cercon Dirve, Box 956
Hillsboro, TX 76645

Gulf Reduction Corp
6020 Esperson, Box 611
Houston, TX 77001

Merichem Co
1914 Haden Road
Houston, TX 77015

American Thermoplastics Corp
1235 Kress
Houston, TX 77020

CONSTAR Plastics Inc
8705 City Park Loop
Houston, TX 77029

Kent Electronics Corp
5600 Bonhomme Rd
Houston, TX 77036

Ozarka-Houston Inc.
9351 E Point Drive
Houston, TX 77054

***Companies that responded to survey**

(Manufacturers Outside RGV Area)

Jet Research Center Inc.
2001 IH 35 S
Alvarado, TX 76009-9775

A & I Laboratories Inc
414 W Fork Dr
Arlington, TX 76012

GOEX Intl Inc.
423 Vaughn Road W
Cleburne, TX 76031

Rangaire Co
501 S Wilhite, Box 177
Cleburne, TX 76033

G T Products Inc
609 Industrial Park
Grapevine, TX 76051

Summa Rx Laboratories Inc
15840 FM 3028, Drawer A
Mineral Wells, TX 76068

Jamak Fabrication Inc
1401 N Bowie Dr
Weatherford, TX 76086

Reliance Comm/Tec Corp
2100 Reliance Pkwy, Box 919
Bedford, TX 76095

Green Bay Packaging Inc
7901 South Frwy, Box 303
Fort Worth, TX 76101

*Martin Sprocket & Gear Inc
3600 McCart Ave, Box 1038
Fort Worth, TX 76101-1038

Lasko Metal Products Inc.
1700 Meacham Blvd
Fort Worth, TX 76106

Witco Corp
611 E Northside Dr
Fort Worth, Tx 76106-9243

Tandy Wire Fabrication
1924 8th Avenue
Fort Worth, TX 76110

*Tandy Molded Products
3131 W Bolt
Fort Worth, TX 76110

*Tandy Specialty Cables
3500 McCart Ave
Fort Worth, TX 76110

Lubrication Engineers Inc.
3851 Airport Frwy, Box 7128
Fort Worth, TX 76111

Cast-Rite Inc.
2010 E Lancaster, Box 2585
Fort Worth, TX 76113

AIRCO
2351 Pecan Ct
Fort Worth, TX 76117

Liberty Carton Co
P. O. Box 14989
Fort Worth, TX 76117

Anderson Laboratories Inc
5901 Fitzhugh Ave
Fort Worth, TX 76119

Computalog Wireline Products Inc
7450 Winscott Rd
Fort Worth, TX 76126

*Composite Technology Inc
1005 Blue Mound Rd
Fort Worth, TX 76131

Trinity Plasticts Inc
901 E Industrial Ave
Fort Worth, TX 76131

*Owen Oil Tools Inc.
8900 Forum Way
Fort Worth, TX 76140

PMS Consolidated
9001 S Freeway
Fort Worth, TX 76140

Panther Industries Inc
600 N Beach, Box 961001
Fort Worth, TX 76161

*Southwestern Petroleum Corp
534 N Main, Box 961005
Fort Worth, TX 76161

Tetra Pak Materials Inc
3300 Airport Rd
Denton, TX 76205

Siecor Corp
9275 Denton Hwy, Box 426
Keller, TX 76248

Howmet Corp
6200 Central Frwy, Box 1616
Wichita Falls, TX 76307

***Companies that responded to survey**

(Manufacturers Outside RGV Area)

Westvaco Corp
10700 Harry Hines Blvd, Box 540668
Dallas, TX 75354-0668

Aloe Vera of America Inc
9660 Dilworth, Box 801428
Dallas, TX 75380

*Arrow Industries Inc
Box 810489
Dallas, TX 75381

E-Systems Inc.,
Majors Field, Box 6056
Greenville, TX 75403-6056

Kimberly-Clark Corp
Loop 286 & FM 137, Box 9000
Paris, TX 75461-9000

*Simpson Pasadena Paper Co
N Shaver St, P. O. Box 872
Pasadena, TX 75501

Georgia-Pacific Corp
FM 130 E, Box 700
Dangerfield, TX 75638

*Texas Processed Plastics Inc
Hwy 69 S, Box 1766
Jacksonville, TX 75766

Cooper Power Systems
2315 E Stallings Drive, Box 630627
Nacogdoches, TX 75963

ElectroCom Automation Inc.
2910 Avenue F, Box 95080
Arlington, TX 76005

M & S System Inc.
2861 Congressman Lane, Box 541777
Dallas, TX 75354-1777

Fibergate Corp
4115 Keller Springs Rd, Box 814610
Dallas, TX 75381

GNB Inc
1880 Valley View Ln, Box 819023
Farmers Branch, TX 75381

Eljer/U S Brass
Hwy 11 E, Box 1031
Commerce, TX 75428

Super Sack Mfg Corp
Hwy 82 E, Box 245
Savoy, TX 75479

*Walmead Industries Inc
1108 Whitaker, Box 1872
Texarkana, TX 75504

Petrolite Corp
1709 Industrial Blvd
Kilgore, TX 75662

Texaco Producing Inc
3 mi W of city og Hwy 75, Box 128
Streetman, TX 75859

Texas Farm Products Co &
Brown Bag Dog Food Co
915 S Fredonia, Box 630009
Nacogdoches, TX 75963-0009

Tucker Housewares
721 111th, Box 5467
Arlington, TX 76005-5467

U S Star Inc
4710 Alexander Ln, Box 560328
Dallas, TX 75356

International Paper Co
P. O. Box 810100
Dallas, TX 75381

Thermalloy Inc.
2021 W Valley View, Box 810839
Farmers Branch, TX 75381

Phillips Lighting Co
3010 Clarksville
Paris, TX 75460

Ennis-Texas Tag
118 W Main, Box D
Wolfe City, TX 75496

*Texas Eastman Co
Kodak Blvd at Estes Dr, Box 7444
Longview, TX 75607

Thiokol Corp
PO Box 1149
Marshall, TX 75671

Lufkin Industries Inc.
Douglas St & Kiln Ave, Box 849
Luflin, TX 75902

*JM Clipper Corp
403 Industrial Dr, Drawer 632340
Nacogdoches, TX 75963-2340

In Vitro Technologies Inc
2100 Road to Six Flags E, Box 202003
Arlington, TX 76006

***Companies that responded to survey**

(Manufacturers Outside RGV Area)

Semtech Corp
1701 N Greeneville Ave #501
Richardson, TX 75081

Fujitsu America Inc.
2801 Telecom Pkwy
Richardson, TX 75082

Electrospace Systems Inc.
1301 E Collins Blvd, Box 831359
Richardson, TX 75083-1359

Packaging Corp of America
1800 E Plano Pkwy, Box 860249
Plano, TX 75086

Eljer/U S Brass
901 10th, Box 869037
Plano, TX 75086-9037

Columbia Extrusion Corp
1200 E Washington
Rockwall, TX 75087

Precision Cable Mfg Co Inc.
1290 IH 30 E, Box 1448
Rockwall, TX 75087-1448

Kaiser Aluminum & Chemical Corp
Hwy 75 S, Box 1215
Sherman, TX 75090

*Precision Specialties
301 N Montgomery
Sherman, TX 75090

Zep Mfg Co
525 Centre Park Blvd, Box 645
DeSoto, TX 75115

Morton Salt
Hwy 110 S, Rte 2 Box 10
Grand Saline, TX 75140

Consolidated Casting Corp
1501 IH 45 S
Hutchins, TX 75141

*AT&T Microelectronics
3000 Skyline Dr
Mesquite, TX 75149

Oil City Iron Works Inc.
909 S 12th, Drawer 1560
Corsicana, TX 75151

*Jetco Chemicals Inc.
Hwy 31 E, Box 1898
Corsicana, TX 75151

AEP Industries Inc
6250 IH 35E N
Waxahachie, TX 75165

International Extrusion Corp-Texas
202 Singleton Drive
Waxahachie, TX 75165

Rock-Tenn Co
6200 IH 35-E N
Waxahachie, TX 75165

Rossan Laboratories Inc
4802 Memphis
Dallas, TX 75207

Siemens Energy & Automations Inc.
4646 Bronze Way, Box 210219
Dallas, TX 75211

Liquid Carbonic Carbon Dioxide
2728 N Westmoreland
Dallas, TX 75212

Occidental Chemical Corp
1100 Lenway
Dallas, TX 75215

Fritz Chemical Co.
PO Drawer 17040
Dallas, TX 75217

Telsco Industries
PO Box 180205
Dallas, TX 75218

Thermo-Serv Inc
3901 Pipestone Rd, Box 223886
Dallas, TX 75222-3886

APAC-Texas
2121 Irving Blvd, Box 224048
Dallas, TX 75222-4048

Integral Corp
1424 Barry Avenue, Box 11269
Dallas, TX 75223

Huntington Laboratories-Southwest Inc
8131 Forney Rd, Box 270609
Dallas, TX 75227

Continental Electronics Corp
4212 S Buckner Blvd, Box 270879
Dallas, TX 75227

Plastican Inc
2651 Santa Anna Ave
Dallas, TX 75228

***Companies that responded to survey**

(Manufacturers Outside RGV Area)

GH Hensley Industires Inc.
2108 Joe Field Road, Box 29779
Dallas, TX 75229

*M D Laboratories Inc
3238 Towerwood Dr
Dallas, TX 75234

Data Documents Inc
3403 Dan Morton Dr
Dallas, TX 75236-1068

*Virginia KMP Corp
4100 Platinum Way
Dallas, TX 75237

Unitron Inc.
10925 Miller Road, Box 38902
Dallas, TX 75238

*Air Liquide
13140 Floyd Rd
Dallas, TX 75243

Heritage Bag Co
4434 McEwen Rd
Dallas, TX 75244

Ecco Chemicals Inc
8505 Directors Row
Dallas, Tx 75247

Decibel Products, Inc.
3184 Quebec, Box 569610
Dallas, TX 75256-9610

*Technical Chemical Co
10737 Spangler Rd, Box 540095
Dallas, TX 75354

The Brinkmann Corp
4215 McEwen Road
Dallas, TX 75234

*Lone Star Steel Co.
PO Box 35888
Dallas, TX 75235

Dart Mfg Co Inc
4012 Bronze Way
Dallas, TX 75237

Dolco Packaging Corp
4700 S Westmoreland Rd
Dallas, TX 75237-1629

Marlow Industries Inc.
10451 Vista Park Road
Dallas, TX 75238-1645

A M X Corp
11995 Forestgate Drive
Dallas, TX 75243-5411

Square D Co.
1111 Regal Row
Dallas, TX 75247

Auto Wax Co Inc
1275 Round Table Dr
Dallas, TX 75247

Decibel Products Inc.
3184 Quebec, Box 569610
Dallas, TX 75256-9610

Varel Mfg Co
9230 Denton Dr, Box 540157
Dallas, TX 75354

Zoecon Corp
12200 Denton Drive
Dallas, TX 75234

Sweetheart Cup Co Inc
4444 W Ledbetter Dr
Dallas, TX 75236

Owens-Brockway
4034 Mint Way
Dallas, TX 75237

Gaylord Container Corp
11333 Kingsley Rd, Box 38008
Dallas, TX 75238

Cormix Constr Chemical Inc.
4930 River Oaks Road, Rt 2 Box 182-[illegible]
Dallas, TX 75239

Southwest Sanitary Co Inc
4553 Sigma
Dallas, TX 75244

Mary Kay Cosmetics Inc
1330 Regal Row
Dallas, TX 75247

Amtech Corp
17304 Preston Road Bldg E #100
Dallas, TX 75252-5613

E-Systems Inc.
PO Box 660023
Dallas, TX 75266-0023

Crain Chemical Co Inc
2630 Andjon Dr, Box 540995
Dallas, TX 75354

*Companies that responded to survey

(Manufacturers Inside RGV Area)

Jonton Alcohol, Inc.
Rt. 3, Box 151-E
8 1/2 Miles W. FM 490
McCook, TX

*Alfa Trading Company
100 E. Savannah Avenue
McAllen, TX 78501

Ridgway's Inc.
519 S. Broadway
McAllen, TX 78501

*R.R. Donnelley & Sons Co.
6800 S 33rd Street
McAllen, TX 78501

A & H Distributors
617 E. Business 83 at McColl Road
McAllen, TX 78501

Griffin & Brand of McAllen
4702 N. 23rd
PO Box 1840
McAllen, TX 78502

INFASA
PO Box 4156
McAllen, TX 78502

AOC-Acetylene Oxygen Co.
2508 S. 23rd St.
McAllen, TX 78503

McAllen American Corp
Kimball Piano & Organ Co.
3600 Formosa Avenue
McAllen, TX 78503

General Electric Company
6700 South 33rd Street
McAllen, TX 78503

Resentel Corp. Ltd.
PO Box 789
Champlain, NY 12919

Hardwicke, John B. Company
100 N. 26th Street
McAllen, TX 78501

Mercorp, Inc.
320-C E. Cedar
McAllen, TX 78501

*Magla Products, Inc.
2201 Uvalde Street, Bay 7
McAllen, TX 78501

TRW Automotive Products
2701 Ebony, Bldg. B
McAllen, TX 78501

Am-Mex Products, Co.
PO Box 5006
McAllen, TX 78502

Rio International Manufacturing
2701 N. McColl C-4
PO Box 4918
McAllen, TX 78502

NOVA/LINK
One Park Place, Suite 100
McAllen, TX 78503

*Cathay Industires International Inc.
3700 Ursula Avenue
McAllen, TX 78503

King's Prosperity Industries
3620 W. Military Highway
McAllen, Tx 78503

Rio Grande Poultry
2 1/2 Mile S. 23rd St.
McAllen, TX 78501

Wholer Imports
3421 N. 23rd Street, 3rd Floor
PO Box 5454
McAllen, TX 78501

TRW, V.S.S.I.
2701 Ebony Avenue, Unit "A"
McAllen, TX 78501

Rafco Freeze Dry Inc.
200 N. 1st St.
PO Box 55
McAllen, TX 78501

Stuart Entertainment, Inc.
700 Sunset Drive, Unit 202
McAllen, TX 78501

Am-Mex Products, Inc.
PO Box 5006
McAllen, TX 78502

Right Away Foods Corp
3000 W. Highway 83
PO Box 55
McAllen, TX 78502

National Medical Care, Inc.
6620 S. 33rd Street
McAllen, TX 78503

Delco Electronics Corp.
General Motors Corp
6901 S, 33rd Street, Bldg. T
McAllen, TX 78503

Whirpool Corporation
4300 W. Military Highway
McAllen, TX 78503

***Companies that responded to survey**

(Manufacturers Inside RGV Area)

*Zenith Electronics Corp of Texas
6601 S. 33rd Street
McAllen, TX 78503

Austin Sculptures & Decorative, Inc.
4328 W. Military Highway
McAllen, TX 78503

Graco Children's Products
5111 N. 10th St., Suite 201
McAllen, TX 78504

Rio Grande Plastics Products Inc.
105 N. Tower Road
Alamo, TX 78516

Federated Metals Corp
PO Box 4647
Brownsville, TX 78520

S.L.-Montevideo Technology Corp.
PO Box 3770
Brownsville, TX 78520

Young International, Ltd.
4501 Carmen Ave, Suite 4
Brownsville, TX 78520

International Assembly, Inc.
4814 Beaver Pond Drive
Brownsville, TX 78520

Hunter Mexico, Inc.
615 Elca Lane, Suite C
Elca Industrial Park
Brownsville, TX 78521

Airpax Corp.
468 Royal Road, Suite 127
Bownsville, TX 78521

Wells Manufacturing Corporation
4312 W. Military Highway
McAllen, TX 78503

Lambda Electronics Corp.
3801 W. Military Highway
McAllen, TX 78503

QC Imports & Management, Inc.
1609 S. Alamo Road
Alamo, TX 78516

Nelco Coil Supply Co
PO Box 877
Alamo, TX 78516

Valley Rio Enterprises
1058 Palm Blvd.
PO Box 208
Brownsville, TX 78520

E.I. Dupont De Nemours
PO Box 3506
Brownsville, TX 78520

Gateway Services
3554 Boca Chica Blvd.
Brownsville, TX 78520

Nova/Link Ltd. Partnership
739 E. Fronton
Brownsville, Tx 78520

Rohm & Haas Latin Americas, Inc.
830 W. Price Rd
Brownsville, TX 78521

La Ventaja, Inc.
700 Paredes Line, Suite 103
Brownsville, TX 78521

Regency Plastics Inc.
6100 S. 42nd St
McAllen, TX 78503

Spiral Binding Co.
6600 N. 16th Street
McAllen, TX 78504

Helena Chemical Co.
PO Box 774
Alamo, TX 78516

Rio Vista Gins Fertilizer Co.
6 1/2 Mile S. Alamo Rd.
Pt. 1, Box 155B
Alamo, TX 78516

Plastic Molding Co.
34 Sagua la Grande
Brownsville, TX 78520

Polymer Reclaim and Exchange
1144 Lincoln St
Brownsville, TX 78520

Stepan Company
PO Box 2027
Brownsville, TX 78520

Epicor Industries
3539 E. 14th Street
Brownsville, TX 78521

Magnetek-Hesgon Division
3525 International Blvd
Brownsville, TX 78521

Top Performance Industries, Inc.
3505 Boca Chica
Brownsville, TX 78521

*Companies that responded to survey

(Manufacturers Inside RGV Area)

Victoreen, Inc.
488 Regal Row, Suite 103
Brownsville, TX 78521

Int. Trade Contract Procurement
531 E. 11th Street
Brownsville, TX 78521

T.K. USA, Inc.
3302 Boca Chica #209
Brownsville, TX 78521

Unique Tool & Gauge
Airport Industrial park
615 Elca Lane, Suite B
Brownsville, TX 78521

Summit Polymers
4402 Austin Road
Brownsville, TX 78521

Becker Manufacturing, Inc.
5224 FM 802
Brownville, TX 78521

Leonard Electric Products Co.
85 Industrial Drive
Brownsville, TX 78521

*AT&T Microelectronics
605 S. Vermillion, Ste C
Brownsville, TX 78521

*Auto Trim, Inc.
International Plaza
4402 Austin Road
Brownsville, TX 78521

*Mextile, Inc.
955 E. St. Charles
PO Box 70
Brownsville, TX 78522

Brownsville Refinery
Port of Brownsville, Hwy 48
PO Box 1306
Brownsville, TX 78522

Rio Grande Tool Company
5295 Commercial Drive
PO Box 4320
Brownsville, TX 78523

Premier Services
5771 E. 14th St.
PO Box 6210
Brownsville, TX 78523

Cabot Petroleum
PO Box 66
Delmita, TX 78536

Gold Line Refining Co.
626 S. 11th
Donna, TX 78537

De La Garza Slaughter House
915 E. Freddy Gonzalez
Edinburg, TX 78539

Chorizo De San Manuel
Rt.3, Box EX9
19 Miles North 281
Edinburg, TX 78539

Marisol Chemical Corporation
1418 E. University
Edinburg, TX 78539

Terra International
PO Box 3190
Edinburg, TX 78540

AM-AG, Inc.
PO Box 1637
305 W. Chapin
Edinburg, TX 78540

Wilbur Ellis Co. Tide Division
PO Box 1020
800 N. Closner
Edinburg, TX 78540

Jencraft Mfg. Co.
310 E. 6th Street
PO Box 1121
Elsa, TX 78543

*General Dynamics Space System
Harlingen Facility
2800 Airport Drive
Harlingen, TX 78550

Pepsi-Cola South
310 N. Eye Street
Harlingen, TX 78550

*Emair
Harlingen Industrial Airpark
Hanger 38
Harlingen, TX 78550

*Aloe Corp
2809 E. Grimes
PO Box 2624
Harlingen, TX 78550

Valley Co-Op Oil Mill
1910 N. Expwy 77
PO Box 1310
Harlingen, TX 78551

*Vera Products, Inc.
2809 E. Grimes
PO Box 2624
Harlingen, TX 78551

*Hygeia Dairy Company
PO Box 751
720 S. "F" Street
Harlingen, TX 78551

Fruit of the Loom
5810 E. Harrison
PO Box 2563
Harlingen, TX 78551

***Companies that responded to survey**

(Manufacturers Inside RGV Area)

AOC-Acetylene Oxygen Co.
PO Box 430
Harlingen, TX 78551

*AT & T
PO Drawer J
Hidalgo, TX 78557

Plasticos Jarmac
PO Box 1366
Hidalgo, TX 78557

Chevron U.S.A. Inc.
Starr Rt. Box 38
Linn, TX 78563

Borden's Inc.
100 Industrial Park
PO Box 837
Mercedes, TX 78570

Texas Citrus Exchange
PO Box 793
Mission, TX 78572

Rio Grande Plastics Products
900 E. Expressway 83
Pharr, TX 78577

*Growers Co-Op
PO Box 432
Rio Grande City,TX 78582

Reef Industries
1951 Amistad Drive
San Benito, TX 78586

*Rio Grande Valley Sugar Growers, Inc.
2 1/2 Mi. W. Highway 107
Drawer A
Santa Rosa, TX 78593

Orval Kent Food Co. Inc.
PO Box 568
Hidalgo, TX 78557

Cinch Connector Division
403 E. Texano Drive
Hidalgo, TX 78557

Windsor Molding
9200 S. Austin
Pharr, TX 78557

Queen City Laundry, Inc.
546 S. Illinois Avenue
Mercedes, TX 78570

Zey's of Texas
7012 Bryan Road
Mission, TX 78572

Anchor Gasoline
Rt. 3, Box 142
Mission, TX 78572

NEL-PAK
PO Box 1297
Raymondville, TX 78580

Citation Casting Mexico
PO Box 112
Rio Grande City,TX 78582

Valley Coca-Cola Bottling Co.
PO Box 393
San Benito, TX 78586

Valley Plastic Suuply & Fabrication
1902 Joe Stephens
Weslaco, TX 78596

S & H Fabricating & Engineering, Inc.
1501 E. Texano
Hidalgo, TX 78557

Converse, Inc.
PO Box 1459
Hidalgo, TX 78557

G.C. Exports, Inc.
1301 High Lowe
Hidalgo, TX 78557

H & H Foods
PO Box 358
Mercedes, TX 78570

Tex-Ag Company
PO Box 633
Mission, TX 78572

*Made-Rite Janitorial Supply
11 N. Palm Drive
Pharr, TX 78577

Cisneros Packing Co, Inc.
5th & Kimball Sts.
PO Box 64
Raymondville, TX 78580

Valley Equipment Corp., Inc.
PO Box 1822
Roma, TX 78584

Lorentson MFG. Co. Inc.
PO Box 632
2101 Amistad Drive
San Benito, TX 78586

Valley Aloe Vera, Inc.
PO Box 598
Weslaco, TX 78596

*Companies that responded to survey

(Manufacturers Inside RGV Area)

*Mid-Valley Chemical Co.
200 W. railroad
PO Box 446
Weslaco, TX 78596

*Ranco Corporation
1900 Billy Mitchell, Bldg. C
PO Box 2257
Brownsville, TX 78522-2257

*Potter Paint Company of Texas
101 Yard Road
PO Box 3267
Brownsville, TX 78523-3267

General Motors Corp
Delco Electronics Corp
PO Box 5448
Brownsville, TX 78523-5448

Preservation Products, Inc.
Port of Brownsville
PO Box 8249
Brownsville, TX 78526-8249

Kearfott Guidance & Navigation Corp.
950 E. Levee Street
PO Box 668
Brownsville,TX 78522-0668

Parker Hannifin Corp.
"O" Ring Division
PO Box 2276
Brownsville, TX 78522-2261

Textron, Inc.
488 Regal Row #107
PO Box 3705
Brownsville, TX 78523-3705

General Motors Corporation
1900 Billy Mitchell Blvd.
Building B--Deck 15/16
Brownsville, TX 78523-5897

TADIM, Inc.
5602 E. Harrison
PO Box 531923
Harlingen, TX 78553-1923

Eaton Corporation
1910 Billy Mitchell
PO Box 712
Brownsville, TX 78522-0712

Duro Bag Mfg. Co.
Port of Brownsville
PO Box 3106
Brownsville, TX 78523-3106

*General Motors Corp
Inlad Fisher Guide Div.
Billy Mitchell Blvd.
Brownsville, TX 78523-4447

Cooper Power Systems
PO Box 8129
Brownsville, TX 78526-8129

*Companies that responded to survey

ENVIRONMENTAL TECHNOLOGY
(Laboratory Analysis and Environmental Sampling)

APPENDIX E

1. Curriculum for Quarter and Semester Systems

2. Course Descriptions for Quarter and Semester Systems

3. Matrices of Courses Vs. Competencies, Equipment Use, Areas of Environmental Concerns, and Pressing (Training) Needs.

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ENVIRONMENTAL TECHNOLOGY
(LABORATORY ANALYSIS AND ENVIRONMENTAL SAMPLING)
PROPOSED ASSOCIATE DEGREE CURRICULUM
(QUARTERS)

			PERIODS PER WEEK			
FIRST QUARTER			LEC.	LAB	SCH	CR
ENV	100	Introduction to Environmental Technology	1	0	12	1
ENGL	1301	Composition I	4	0	48	3
MATH	1314	College Algebra	4	0	48	3
GT	1001	Orientation	1	0	12	1
CHT	120	General Chemistry I	3	6	108	5
CHT	122	Chemical Calculations I	2	6	96	4
			15	12	324	17
SECOND QUARTER						
ENV	110	Safety in the Workplace-Spill Control and Cleanup of Hazardous Materials	3	3	72	4
SPCH	1311	Introduction to Speech	4	0	48	3
CHT	124	General Chemistry II	3	6	108	5
CHT	204	Chemical Calculations II	2	6	96	4
			12	15	324	16
THIRD QUARTER						
ENV	210	Sample Collection and Storage	3	3	72	4
CHT	202	Organic Chemistry I	3	3	72	4
CHT	206	Analytical Chemistry I	2	6	96	4
MATH	1342	Statistics	4	0	48	3
IMT	1013	Introduction to Computer Applications	2	4	72	3
			14	16	360	18
FOURTH QUARTER						
ENV	220	Environmental Sample Characterization and Analysis	3	6	108	5
CHT	207	Analytical Chemistry II	3	6	108	5
CHT	210	Analytical Instruments I	2	6	96	4
PSYC	2301	General Psychology	4	0	72	3
			12	18	360	17

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Environmental Technology
(Laboratory Analysis & Environmental Sampling)
Proposed Associate Degree Curriculum

			PERIODS PER WEEK LEC.	LAB	SCH	CR.
FIFTH QUARTER						
ENV	310	Instrumental Analysis of Water, Soil, and Air	3	6	108	5
CHT	302	Analytical Instrument II	2	6	96	4
Elective*			4	0	48	3
ENV	330	Environmental Toxicology	3	2	72	4
			12	15	324	16
SIXTH QUARTER						
ENV	340	Advanced Environmental Analysis Regulations, Permits, and Compliance	3	6	108	5
ENV	320	Hazardous Materials Emergency Response and Waste Operations (HAZWOPER)	3	3	72	4
ENV	350	Quality Assurance & Quality Control in the Laboratory	2	6	96	4
ENV	390	Environmental Seminar**	2	0	24	2
			10	15	300	15

Total Credit Hours----------99
Total Contact Hours---------1992

*Must be taken outside major department
**May be substituted by ENV 298, ENV 398, ENV 199, or ENV 299

Environmental Technology (Laboratory Analysis and Environmental Sampling)

COURSE DESCRIPTIONS
(QUARTER)

ENV - 100 Introduction to Environmental Technology (Laboratory Analysis and Environmental Sampling) (1-0-1)

This course is an orientation to Environmental Technology. The local, state and national environmental concerns, as well as the laws and regulations governing industrial permits and compliance will be included. The course addresses the employment prospects of an environmental technician and their responsibilities. The U.S. Department of Labor Secretary's Commission on Achieving Necessary Skills (SCANS) will be introduced. A written report will be required.

ENV - 110 Safety In The Workplace - Spill Control And Cleanup Of Hazardous Materials (3-3-4)

This course addresses the laboratory safety requirements that an Environmental Technician (Laboratory Analyst) must master in order to perform his/her tasks safely and environmentally compliant. The course addresses the Hazard Communication Act (HAZCOM), Spill Control, Cleanup, Disposal, and Reporting requirements. Prerequisites: ENV-100, CHT-120, and CHT-122.

ENV - 199 Co-op for Environmental Technology (Laboratory Analysis and Environmental Sampling) (1-19-3)

In this course, training is provided under the joint cooperation of TSTC and industry in the student's program of study. Prerequisite: Fourth-quarter standing.

ENV - 210 Sample Collection And Storage (3-3-4)

This course is a study of the regulations, protocols, and procedures for collection and storage of air, soil, and liquid samples. Quality Assurance/Quality Control, Site Selection, Sample storage and sample preservation are emphasized. A research paper will be required. Prerequisites: CHT-124, CHT-204, and ENV-110.

ENV - 220 Environmental Sample Characterization and Analysis (3-6-5)

This course is a practical study that is laboratory specific in the characterization of samples by the determination of physical and chemical properties. Wet and colorimetric analysis such as pH, turbidity and conductivity, BOD, COD, specific gravity using kits and analytical instruments will be mastered. Sampling, sample storage and chain-of-custody will be included. Prerequisites: CHT-206, ENV-210.

ENV - 298 Co-op for Environmental Technology (Laboratory Analysis and Environmental Sampling) (1-39-6)

In this course, training is provided under the joint cooperation of TSTC and industry in the student's program of study. Prerequisite: Fourth-quarter standing.

ENV - 299 Co-Op For Environmental Technology (Laboratory Analysis And Environmental Sampling) (1-19-3)

In this course, training is provided under the joint cooperation of TSTC and industry in the student's program of study. Prerequisite: Fourth-quarter standing.

ENV - 310 Instrumental Analysis of Water, Soil, and Air (3-6-5)

This course is a continuation of ENV-220 and encompasses the analyses that require the use of analytical instrumentation such as Gas Chromatographs, Infrared Spectrophotometers, Inductively Coupled Spectroscopy, Atomic Absorption Spectroscopy, High Performance Liquid Chromatography and Mass Spectroscopy. Sample extraction, preparation, and instrument calibration are also included in this course. Formal reports are required for all experiments conducted. Prerequisites: ENV-220, CHT-210, and MATH-1342.

ENV - 320 Hazardous Materials Emergency Response and Waste Operations (HAZWOPER) (3-3-4)

This course covers the 29 CFR and OSHA standards as the 40 Hour requirement for first responders. The course includes Hazardous Material (HAZMAT) recognition, use of Material Safety Data Sheets (MSDS), toxicology, monitoring, sampling, spill control and containment. Contingency planning and site safety planning will also be discussed. Formal reports are required for all experiments conducted. Prerequisite: ENV - 220.

ENV - 330 Environmental Toxicology (3-3-4)

This course addresses toxicity and toxicology as it pertains to the environmental effects on plants and animals. The course addresses cell function, plant/animal dependence and the environment, the food chain, Bioassays, LD_{50} as well as environmental contamination. Specific attention is given to toxicological effects on target organs, the metabolic processes, and laboratory experimentation in Bioassays. Formal reports are required for all experiments conducted. Prerequisite: ENV - 220.

ENV - 340 Advanced Environmental Analysis, Regulations, Permits and Compliance (3-6-5)

This course is a continuation of ENV-310 discussing a variety of regulatory and enforcement agencies and their authority. The more comprehensive and complex analysis such as Toxicity Characteristic Leaching Procedure (TCLP), Polychlorinated Biphenyls (PCB), and other procedures will be studied and performed. Quality Assurance and Quality Control as well as correct disposal procedures will be discussed and performed. Formal reports are required for all experiments conducted.
Prerequisite: ENV-310, and CHT-302.

ENV - 350 Quality Assurance And Quality Control In The Laboratory (2-6-4)

This course covers Quality Assurance/Quality Control procedures that must be performed on the analytical laboratory to confirm viability and confidence of sample results. Specific emphasis is placed on documentation of samples, standard preparation, check sample preparation, determination of check sample recovery to determine mean recovery, standard deviation and establishment of control tables using standard deviations to set tolerances. Interlaboratory as well as intralaboratory quality control programs will be discussed. Formal reports are required for all experiments conducted.
Prerequisite: ENV-310

ENV - 390 Environmental Seminar (2-0-2)

This course will expose the student to speakers from Industry and Regulatory Agencies addressing current environmental topics through presentations and/or tours. Specific environmental responsibilities of industry and regulatory agencies will be addressed. The student will report on an interview with a representative from both a manufacturing industrial facility and a regulatory agency. Prerequisite: 5th Quarter Standing

ENV - 398 Co-Op For Environmental Technology (Laboratory Analysis And Environmental Sampling) (1-39-6)

A continuation of ENV-298. Training is provided under the joint cooperation of TSTC and industry in the student's program of study. Formal reports are required for all experiments conducted. Prerequisite: ENV-298.

CHT-120 General Chemistry I (3-6-5)

This course introduces basic principles of scientific measurements, properties of matter, chemical nomenclature, chemical equations of elements and calculations necessary to determine temperature, metric conversions to English conversions, density and percent compositions of elements in compounds. Laboratory work includes completion of 20 experiments and notebook write-ups. Corequisites: MATH-090, ENGL-090, CHT-122.

CHT-122 Chemical Calculations I (2-6-4)

This course parallels and supports CHT-120, with emphasis on solving problems similar to those included in CHT-120 exercises and laboratory experiments. Logarithms are introduced and heavy emphasis is placed on oxidation-reduction equations. Corequisites: CHT-120, MATH-090.

CHT-124 General Chemistry II (3-6-5)

This course introduces the theories and principles of bonding, spectroscopy, solution, acids-bases and equilibria. Laboratory work reinforces basic laboratory skills and introduces basic analytical instruments. The laboratory work includes completion of 20 experiments and laboratory notebook write-ups. Prerequisites: MATH-090, CHT-120, CHT-122.

CHT-202 Organic Chemistry I (3-3-4)

This course presents an overview of the classification, characteristics and structure of carbon compounds, and introduces basic organic laboratory skills procedures. Formal reports are required for all experiments conducted. Prerequisites: CHT-120. CHT-122, MATH-090. Corequisites: CHT-124, CHT-204.

CHT-204 Chemical Calculations II (2-6-4)

This course is a continuation of CHT-122, with emphasis in stoichiometry, solutions, titrations and equilibrium. Prerequisites: CHT-120, CHT-122. Corequisites: CHT-124, MATH-1314.

CHT-206 Analytical Chemistry I (2-6-4)

This is a gravimetric analysis course emphasizing the analysis of samples by precipitation adhering to strict accuracy and precision criteria. Formal reports are required for all experiments conducted. Prerequisites: CHT-124, CHT-204, MATH-1314.

CHT-207 Analytical Chemistry II (3-6-5)

This course is an introduction to titrimetric methods of analysis, with emphasis in the theory and application of neutralization titrations, complex formation titrations, theory and application of oxidation-reduction titrations and potentiometric titrations. Formal reports are required for all experiments conducted. Prerequisites: CHT-124, MATH-1314.

CHT-210 Analytical Instrumentation I (2-6-4)

This course is an introduction to instrumental methods in developing an understanding of the operation, maintenance and calibration of the gas chromatograph, atomic absorption spectrophotometer, ASTM distillation apparatus, kinematic viscosity bath, pH meters, Carle Fisher Moisture Analyzer and HPLC. Laboratory work includes a requirement for the submission of a formal report for each of the experiments performed. Prerequisites: CHT-124, CHT-204, MATH-1314.

CHT-302 Analytical Instrumentation II (2-6-4)

This course is a continuation of CHT-210, with the theoretical presentation of ion chromatography, GC/MS analysis, infrared spectroscopy, high performance liquid chromatography and the interpretation of the data obtained from each of the instruments. Laboratory work requires a formal report for each experiment completed. Prerequisite: CHT-210.

ENGL-1301 Composition I (4-0-3)

Principles and techniques of written composition, textual analysis, and critical thinking. Prerequisite: ENGL 091 or equivalent as determined by English placement test.

GT-1001 Orientation (1-0-1)

This course acquaints students with the history, philosophy, organizational structure and applicable policies and procedures of TSTC. An overview of student services, various course offerings and seminars and community resources is provided. This course provides information on certificate and degree requirements, developmental courses and the Texas Assessment of Scholastic Performance (TASP) test. Certificate and/or degree plans will be completed by the students and filed with the Office of Admissions and Records. Credit is limited to either GT-1001 or GT-1003.

IMT-1013 Introduction to Computer Applications (2-4-3)
This course is an introduction to microcomputer operations and the use of application software. Microcomputer topics include word processing, spreadsheet analysis and data base. Topic reinforcement is accomplished through laboratory experience.

MATH-1314 College Algebra (4-0-3)
The study of complex numbers, exponential and logarithmic functions, inequalities, determinants and matrices, and sequences and series. The course includes non-linear systems of equations and higher-degree equations. Prerequisites: MATH 090 or equivalent determined by MATH Placement Test.

MATH-1342 Statistics (4-0-3)
Presentation and interpretation of data, probability, sampling. Correlation and regression, analysis of variance, and use of statistical software. Prerequisite: MATH 1314.

PSYC-2301 General Psychology (4-0-3)
A survey of the major topics in psychology. Introduces the study of behavior and the factors that determine and affect behavior.

SPCH-1311 Introduction to Speech Communications (4-0-3)
Theories and practice of speech communication behavior in interpersonal, small group, and public communication situations.

COURSE OBJECTIVES
(QUARTER)

ENV-100 INTRODUCTION TO ENVIRONMENTAL TECHNOLOGY

1. State or write the curriculum requirements for the environmental technology program. (SCANS 3A, 4A, 6A, 6B, 7A)
2. Describe the primary environmental concerns at the local, state, and national level. (SCANS 3A, 3C, 7A, 7D, 7F)
3. State who is responsible for the environment at the local, state, and national level. (3A, 3C, 7E)
4. List the Environmental Regulatory Agencies affecting the local, state, and national concerns and regulations. (SCANS 3A, 3C)
5. List the principal laws affecting the environment, especially Air, Soil, and Water. (SCANS 3A, 3C, 6A, 6B)
6. Describe what Permits are and what compliance means as they affect industry in Texas and the U.S. (SCANS 3A, 3C, 6B, 7A, 7D)
7. State who requires the skills that an Environmental Technician possesses and why. (SCANS 3A, 3C, 4A, 6D, 6E, 7C)
8. List the principal responsibilities and duties of an Environmental Laboratory technician. (SCANS 3A, 3C, 4A, 6D, 6E, 7C)
9. Define professional integrity and ethics. (SCANS 3A, 3C, 4A, 6B, 7F)
10. Describe the SCANS Report requirements. (SCANS 3A, 3C, 6B, 7A, 7D)

ENV - 110 SAFETY IN THE WORKPLACE - SPILL CONTROL & CLEANUP OF HAZARDOUS MATERIALS

1. State who is responsible for safety in the workplace and the accident reporting procedures. (SCANS 1D, 2A, 2B, 3A, 3C, 8A, 8C, 8E)
2. Explain the importance of the HAZARD COMMUNICATION ACT. (SCANS 3A, 3C, 4A, 6B, 8A, 8C, 8D, 8E)
3. State the purpose of an MSDS and its use. (SCANS 3A, 3C, 8A, 8B, 8C, 8D, 8E)
4. Explain and demonstrate the use of Chemical Container Labels stating personal precautions, usage procedures, and storage. (SCANS 3A, 3C, 4A, 6B, 8A, 8C, 8D, 8E)
5. Explain what a Laboratory Contingency Plan should contain and its purpose. (SCANS 1C, 1D, 2A, 2B, 2C, 3A, 3B, 3C, 4A, 4B, 8)
6. List Spill Prevention considerations, control, and perform cleanup measures. (SCANS 1C, 1D, 2A, 2B, 2C, 3A, 3B, 3C, 4A, 4B, 8)
7. State the correct disposal procedures for chemical containers, waste chemicals, and chemical residue. (SCANS 1C, 3A, 4A, 4B, 5A, 8A, 8C, 8E)
8. Describe placards and explain their use. (SCANS 3A, 3C, 8A, 8B, 8C, 8D, 8E)
9. Explain the steps to follow in Hazardous Material Response and list the resources available. (SCANS 1C, 1D, 2A, 2B, 2C, 3A, 3B, 3C, 4A, 4B, 8)

10. Define LD_{50}, !DLH, and explain First Aid Procedures in the case of acute chemical exposure. SCANS (3A, 3C, 4A, 4B, 7F)
11. Identify the kinds and types of Fume Hoods necessary in the chemical laboratory. (SCANS 1A, 3A, 4A, 4C)
12. Donn a Self Contained Breathing Apparatus and a Personal Protective Equipment uniform correctly. (SCANS 1A, 5A, 5B, 8 All)
13. Correctly package and label Hazardous Material for shipment to a waste disposal site. (SCANS 1C, 3A, 4A, 4B, 5A, 5B, 7F, 8 All)

ENV - 210 SAMPLE COLLECTION AND STORAGE

1. List the key environmental enforcement agencies in the U.S. and Texas. (SCANS 3A, 3C, 7D)
2. List the environmental substrates of concern addressed by environmental regulations. (SCANS 3A, 3C, 7D)
3. Define a permit, state why it is necessary and who the responsible entities are. (SCANS 3A, 3C, 6B, 7A, 7B)
4. Define compliance as it pertains to environment and describe the reporting procedures required by the regulating agencies. (SCANS 3A, 3C, 6B, 7A, 7B)
5. State why samples are collected, and list the sampling considerations that must be followed prior to sampling. (SCANS 3A, 4A, 6B, 7A, 7E, 7F)
6. List the quality control measures that must be taken prior to and during field sampling. (SCANS 4A, 4B, 7B, 7D)
7. List the various sampling containers and their specific use. (SCANS 3A, 3C, 7D)
8. List the sample site selection considerations necessary prior to sampling. (SCANS 3A, 3C, 7D, 4A, 4B)
9. State the label information necessary on each sample container. (SCANS 3A, 4A, 6B, 6E, 7A, 7E, 7F)
10. Define Chain-of-Custody and explain why it is necessary. (SCANS 3A, 3C, 6B, 7A, 7B)
11. List the steps required for collecting samples for water, soil, and air. (SCANS (SCANS 3A, 4A, 6B, 7A, 7E, 7F)
12. State the storage and preservation specifications for water, soil, and air samples. (SCANS 1A, 4A, 4B, 5A, 5B, 7F, 8A, 8D)
13. State the disposal criteria for soil, air, and water samples after analysis. (SCANS 1A, 4A, 4B, 5A, 5B, 7F, 8A, 8D)
14. Define Quality Assurance/Quality Control and state why it is so critical. (SCANS 1C, 1D, 3A, 3C, 4A, 4B, 5A, 5B, 6A, 6B, 6C, 7C, 7D, 8A, 8D, 8E)
15. Identify, clean, and store pre-used sample containers. (SCANS 1A, 3A, 3B, 4A, 5A, 5B)
16. Calibrate air, water, and soil sampling devices. (SCANS 1A, 4A, 4B, 5A, 5B)

17. Create a sampling plan for air, water, and soil sample collection. (SCANS 1C, 2B, 2C, 3A, 3C, 3D, 4A, 5A, 5B)
18. List the labeling and packaging specifications necessary for transporting samples. (SCANS 4A, 5A, 5B, 6A, 6B, 7D)

ENV - 220 ENVIRONMENTAL SAMPLE CHARACTERIZATION AND ANALYSIS

1. Name the principal regulations that affect water quality in the United States and Texas. (SCANS 3A, 3C, 6A, 6B, 7A, 7F)
2. List the sampling equipment necessary for the collection of air, soil, and water samples. (SCANS 1C, 3A, 3C, 4A)
3. List the preservation and storage specifications for collected air, soil, and water samples. (SCANS 1C, 3A, 3C, 4A, 4B, 5A, 5B)
4. Name the analytical procedures that exist for the analysis of air, soil, and water samples. (SCANS 3A, 3C, 4A, 5A, 5B, 7E)
5. Describe the sample extraction procedures for the analysis of air, soil, and water samples. (SCANS 3A, 3C, 4A, 5A, 5B, 6B, 6E, 7E)
6. List the instruments required for the physical analysis of air, soil, and water samples. (SCANS 1C, 3A, 3C, 4A)
7. Explain the necessary Quality Assurance/Quality Control procedures for the analysis of air, soil, & water samples. (SCANS 1C, 1D, 3A, 3C, 4A, 4B, 5A, 5B, 6A, 6B, 6C, 7B, 7C, 8A, 8D, 8E)
8. Present the data obtained from the analysis of assigned samples and defend the integrity of the equipment, technician, and the procedure used. (SCANS 1C, 3A, 3C, 4A, 4B, 5A, 5B, 6C, 7A, 7C, 7F, 8 All)
9. Calibrate a pH Meter and determine the pH of water, air, and soil samples. (SCANS 1A, 4A, 4B, 5A, 5B)
10. Determine the amount of suspended solids in a sample by weight. (SCANS 5A, 5B, 6C, 7C)
11. Calibrate a turbidometer, a conductivity meter, and determine the conductivity & turbidity of a sample. (SCANS 1A, 4A, 4B, 5A, 5B)
12. Determine the concentration of mono and polyatomic ions using ion selective electrodes. (SCANS 5A, 5B, 6C, 7C)
13. Use the Hach Analysis Kit to analyze samples for EPA approved methods. (Acidity, Alkalinity, Metals, Chloride, Conductivity, Cyanide, Fluoride, Hardness for Ca, Hardness for Ca and Mq, Iron, Lead, Manganese, OD, etc) SCANS 1C, 3A, 3B, 3C, 4A, 4B, 5A, 5B)
14. Prepare samples and determine Biological Oxygen Demand. (SCANS 5A, 5B, 6C, 7C)
15. Perform all the above mentioned analysis following required Quality Assurance and Quality Control Guidelines. (SCANS 1C, 1D, 3A, 3C, 4A, 4B, 5A, 5B, 6A, 6B, 6C, 7B, 7C, 8A, 8D, 8E)
16. Determine percent moisture, texture and structure in soil samples. (SCANS 5A, 5B, 6C, 7C)

17. Calibrate and use the Portable Volatile Gas Analyzer. (SCANS 1A, 4A, 4B, 5A, 5B)
18. Collect and analyze air samples using air traps. (SCANS 1C, 1D, 2C, 3A, 4A, 4B, 4C, 5A, 5B, 8 All)

ENV - 310 INSTRUMENTAL ANALYSIS OF WATER, SOIL, AND AIR

1. Name the regulations affecting water, soil, and air quality. (SCANS 3A, 3C, 6A, 6B, 7A, 7F)
2. Describe the analytical procedures of air, water, and soil for pesticides. (Name the Procedures) (SCANS 1C, 3A, 3B, 3C, 4A, 4B, 5A, 5B)
3. Name the pesticide chemical family groups commonly analyzed when monitoring air, soil, and water samples. (SCANS 6B, 7B)
4. Collect, preserve, and store environmental samples for analysis. (SCANS 1C, 4A, 4B, 5A, 5B, 8 All)
5. Extract soil, air, and water samples following the prescribed analytical procedures required by EPA for analysis. (SCANS 4All, 5All, 8 All)
6. Calibrate the Gas Chromatograph and detectors for the analysis of samples. (SCANS 1A, 4A, 4B, 5A, 5B)
7. Calibrate the Atomic Absorption Spectrophotometer for the analysis of samples for metals. (Flame and Graphite Furnace) (SCANS 1A, 4A, 4B, 5A, 5B)
8. Calibrate the High Performance Liquid Chromatograph and/or the Ion Chromatograph for the analysis of samples. (SCANS 1A, 4A, 4B, 5A, 5B)
9. Analyze air, water, and soil samples using the Gas Chromatograph, HPLC, and the Atomic Absorption Spectrophotometer. (SCANS 1C, 3A, 3B, 3C, 4A, 4B, 5A, 5B)
10. Prepare standards for the analysis of samples by GC, HPLC, and AA. (SCANS 1C, 3A, 3B, 4)
11. Establish a QA/QC plan for each different type of Analytical Procedure in GC, HPLC, and AA. (Spikes, Blanks, and Standards) (SCANS 1C, 1D, 3A, 3C, 4A, 4B, 5A, 5B, 6A, 6B, 6C, 7C, 7D, 8A, 8B, 8E)
12. Present and defend experimental data to the class and faculty for one report. (SCANS 1C, 3A, 3C, 4A, 4B, 5A, 5B, 6C, 7A, 7C, 7F, 8 All)
13. Assure Chain-of-Custody protocol is followed on all procedures performed on each sample. (SCANS 1A, 2A, 2C, 4A, 4B, 5A, 5B, 8 All)
14. Characterize samples, and analyze oil and grease samples. (SCANS 1C, 3A, 3B, 3C, 4A, 4B, 5A, 5B)

ENV - 320 HAZARDOUS MATERIALS EMERGENCY RESPONSE AND WASTE OPERATIONS (HAZWOPER)

1. State what regulation requires HAZWOPER training. (SCANS 3A, 3C, 7D)
2. State the potential number of chemicals that exist as probable Hazardous Materials. (SCANS 6B, 7B)

COURSE OBJECTIVES - (QUARTER)

3. List at least ten hazardous materials to which emergency response personnel may respond. (SCANS 6B, 7B)
4. State the methods of HAZMAT identification, placard use and requirements as well as placard application rules. (SCANS 3A, 4A, 6A, 6B, 6E, 7A)
5. Describe the bodily contamination routes of entry and first aid considerations. (SCANS 3A, 3C, 4A, 4B, 6B, 6E, 7A)
6. Define TLV-TWA, TLV-STEL, and TLV-C. (SCANS 3A, 3C, 4A, 4B, 6B, 6E, 7A)
7. Define solubility, specific gravity, LEL, and pH. (SCANS 3A, 3C, 4A, 4B, 6B, 6E, 7A)
8. Define and describe the Incident Control System and Span of Control. (SCANS 3A, 3C, 4A, 4B, 6B, 6E, 7A)
9. Name the general work zones and the six steps the Hazardous Materials incident. (SCANS 6B, 7B)
10. State and describe the OSHA regulations that requires the use of personal protective equipment, PPE. (SCANS 6B, 7B)
11. Define the four levels of protection A, B, C, and D. (SCANS 3A, 3C, 4A, 4B, 6B, 6E, 7A)
12. State when SCBA-self contained breathing apparatus is required. (SCANS 3A, 3C, 4A, 4B, 6B, 6E, 7A)
13. List the decontamination steps required. (SCANS 6B, 7B)
14. Prepare a contingency plan with mutual support. (SCANS 3A, 4A, 6B, 7A, 7E, 7F)
15. Collect HAZMAT samples for analysis following correct procedures and Chain-of-Custody. (SCANS 1C, 1D, 2C, 3A, 4A, 4B, 4C, 5A, 5B, 8 All)
16. Package waste hazardous material for shipping following Department of Transportation guidelines. (SCANS 1C, 3A, 4A, 4B, 5A, 5B, 7F, 8 All)

ENV - 330 ENVIRONMENTAL TOXICOLOGY

1. Define Toxicity and Toxicology. (SCANS 3A, 3C, 6A, 6B)
2. Define or explain Environmental Toxicity and Environmental Toxicology. (SCANS 3A, 3C, 6A, 6B)
3. Compare and contrast the structure of an animal cell and a plant cell. (SCANS 3A, 3B, 3C, 6B, 7A, 7B, 7C, 7D, 7F)
4. Explain how a cell receives nourishment and discards waste. (SCANS 3A, 3B, 3C, 6B, 7A, 7B, 7C, 7D, 7F)
5. Explain how animals and plants depend on the environment. (SCANS 3A, 3B, 3C, 6B, 7A, 7B, 7C, 7D, 7F)
6. Describe the Food Chain and explain the environmental and toxicological effects within it. (SCANS 3A, 3B, 3C, 6B, 7A, 7B, 7C, 7D, 7F)
7. Define and Explain Bioassay and LD_{50}. (SCANS 3A, 3C, 6A, 6B)
8. List those agencies that regulate, establish, and enforce environmental contamination. (SCANS 4A, 4B, 6A, 6B, 6E, 7B, 7D, 7F, 8A)
9. List the key human target organs affected by toxic compounds and the symptoms that may be observed. (SCANS 4A, 4B, 6A, 6B, 6E, 7B, 7D, 7F, 8A)

10. Define Metabolism and explain why understanding this metabolic process is important. (SCANS 3A, 3C, 6A, 6B, 7A, 7B, 7C, 7D)
11. Collect samples from a Bioassay Project and analyze them by following the required protocols and procedures. (SCANS 1A, 1C, 2A, 2F, 3A, 3B, 3C, 4A, 4B, 5A, 5B, 5C, 6A, 6B, 7A, 7B, 7C, 7D, 8A, 8D, 8E)

ENV - 340 ADVANCED ENVIRONMENTAL ANALYSIS, REGULATIONS, PERMITS, AND COMPLIANCE

1. Define the Resource Conservation Recovery Act, Clean Air Act, and the Clean Water Act. (SCANS 3A, 3C, 6B, 7A, 7B)
2. Define the Comprehensive Environmental Response Compensation and Liability Act (SUPERFUND). (SCANS 3A, 3C, 6B, 7A, 7B)
3. Describe the NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM - NPDES, Safe Drinking Water Act and the Federal Pollutant Control Act. (SCANS 3A, 3C, 6B, 7A, 7B)
4. Explain the reason for TCLP Analysis, EPA Method 1311. Total Characteristic Leaching Procedure. (SCANS 3A, 3C, 5A, 6A, 6B, 6E)
5. Define the Federal Insecticide Fungicide and Rodenticide Act (FIFRA) Pesticide Analytical Requirements. (SCANS 3A, 3C, 6B, 7A, 7B)
6. Extract a sample for the analysis of PCBs from air, water, soil, or oil samples. (SCANS 4 All, 5 All, 8 All)
7. Calibrate the Gas Chromatograph, High Performance Liquid Chromatograph, and the Atomic Absorption Spectrophotometer for the analysis of PCB, Pesticides, metals, and other specific priority pollutants. (SCANS 1A, 4A, 4B, 5A, 5B)
8. Establish and maintain an ongoing Quality Assurance/Quality Control program for the analysis of samples for pesticides, PCB and other assigned. (SCANS 1C, 1D, 3A, 3C, 4A, 4B, 5A, 5B, 6A, 6B, 6C, 7C, 7D, 8A, 8D, 8E)
9. Comply with Chain-of-Custody requirements in the analytical process for all samples analyzed. (SCANS 1A, 2A, 2C, 4A, 4B, 5A, 5B, 8 All)
10. Determine which detector will be used for each analysis required by the regulations discussed in this course. (SCANS 1C, 5A, 5B)
11. Prepare Standards from 100% purity or less-stock, Intermediate and Working Standards. (SCANS 3A, 3C, 4A, 4B, 5A, 5B, 8 All)

ENV - 350 QUALITY ASSURANCE AND QUALITY CONTROL IN THE LABORATORY

1. Explain why Quality Assurance and Quality Control are essential in the analysis of environmental samples to prove compliance with permit authorization. (SCANS 3A, 3C, 4A, 4B, 5A, 5B, 6A, 6B, 6E, 7F, 8A)
2. Define Interlaboratory Quality Control and Intralaboratory Quality Control. (SCANS 3A, 3C, 4A, 5A, 6B, 7F)

COURSE OBJECTIVES - (QUARTER)

3. Define Accuracy and precision and support each definition by activities that occur in the laboratory. (SCANS 3A, 3C, 4A, 5A, 6B, 7F)
4. List those Quality Assurance and Quality Control items that affect equipment and instrumentation in the laboratory. (SCANS 4A, 4B, 6B, 6E)
5. List the QA/QC items that are required to support that results obtained from sample analysis are viable. (SCANS 4A, 4B, 6B, 6E)
6. Prepare Stock, Intermediate, and Working Standards from 100% purity or lower purity assayed standards. (SCANS 1C, 3A, 3B, 3C, 4A, 4B, 6C)
7. Prepare Combination standards to ug/ml or ng/ml concentrations from intermediate standards following QA/QC documentation guidelines. (SCANS 1C, 3A, 3B, 3C, 4A, 4B, 6C)
8. Collect a sample pool, assay it for background and prepare spike samples and blanks for use in the analysis of environmental samples. (SCANS 3A, 3B, 3C, 4A, 4B, 5A, 5B, 8 All)
9. Keep a laboratory notebook on every activity performed in the lab by yourself and your subordinates. (SCANS 1A, 3A, 3B, 3C, 3D, 4A, 4B, 5A, 5B, 6A, 6B, 6E)
10. Keep an equipment maintenance logbook and update it each time an instrument is re-calibrated, maintained or repaired. (SCANS 1A, 2A, 3A, 3B, 3C, 4A, 4B, 5A, 5B, 8 All)
11. Keep a Standard Preparation LOG for each stock, intermediate, and working standard prepared. (SCANS 1A, 2A, 3A, 3B, 3C, 4A, 4B, 5A, 5B, 8 All)
12. Keep a sample LOG that tracks every sample from arrival to the laboratory until the final report is generated and sample disposal is documented. (SCANS 1A, 2A, 3A, 3B, 3C, 4A, 4B, 5A, 5B, 8 All)

ENV - 390 ENVIRONMENTAL SEMINAR

1. Plan and prepare to interview representatives from Industry and regulatory agencies. (SCANS 1A, 2B, 2C, 2E, 2F, 3A, 3B, 3C, 3D, 4A, 6A, 6B, 6D, 7A, 7B, 7C, 7D)
2. Assess interview results and prepare an oral report. (SCANS 1A, 1C, 2F, 3A, 3B, 3C, 3D, 4A, 4C, 5A)
3. Present an oral report to a student and faculty panel on the information collected from the interviews. (SCANS 3A, 3B, 3C, 3D, 4A, 5A, 5B, 6A, 6B, 6C, 6E, 7A, 7B, 7C, 7F, 8A, 8B, 8C, 8D, 8E)
4. Prepare a formal technical report comparing and contrasting the roles and responsibilities of industrial environmental laboratories and regulatory agencies. (SCANS 3A, 3B, 3C, 3D, 4A, 5A, 5B, 6A, 6B, 6C, 6E, 7A, 7B, 7C, 7F, 8A, 8B, 8C, 8D, 8E)

CHEMICAL TECHNOLOGY SUPPORT COURSES FOR ENVIRONMENTAL TECHNOLOGY OBJECTIVES (QUARTERS)

CHT - 120 GENERAL CHEMISTRY I

1. Identify and use basic laboratory equipment. (SCANS 1C, 4A, 5A, 5B)
2. Apply Scientific method in laboratory exercises. (SCANS 7A, 7F, 3A, 3B, 3C)
3. Format laboratory report using experimentally collected data. (SCANS 3A, 3B, 3C, 7A, 7F, 8A, 8B, 8D, 8E)
4. Convert measurements of mass, length, and volume from English units to metric units, and vice versa. (SCANS 6C, 7C, 3A)
5. Express answers to calculations with proper significant figure and scientific notation. (SCANS 6C, 7C)
6. Make temperature conversions using fahrenheit, Celsius and Kelvin scales. (SCANS 6C, 7C)
7. Calculate density, mass or volume of an object from appropriate data. (SCANS 6C, 7C, 7F)
8. Solve chemical calculations using dimensional analysis approach. (SCANS 6C, 7A, 7C, 7F)
9. Distinguish between elements, compounds, and mixtures. (SCANS 7A, 7B, 7E, 7F)
10. Write symbols or names for common elements. (SCANS 6A, 6B, 7F)
11. Differentiates molecules and ions. (SCANS 4A, 6A, 6B, 7A, 7B)
12. Identify physical and chemical properties and physical and chemical changes. (SCANS 4A, 6A, 6B, 7A, 7B)
13. Write formulas and name compounds. (SCANS 3C, 4A, 6A, 6B, 7A, 7B)
14. Write and balance chemical equations. (SCANS 3C, 4A, 6A, 6B, 7A, 7B)
15. Complete and balance basic types of chemical equations. (SCANS 3C, 4A, 6A, 6B, 7A, 7B)
16. Describe subatomic particles of an atom. (SCANS 6A, 6B, 7A, 7E)
17. Identify mass number and atomic number using periodic table. (SCANS 6A, 6B, 7A, 7E)
18. Write electron configuration and Lewis structures for an elements. (SCANS 3C, 4A, 6A, 6B, 7A, 7B)
19. Describe periodic arrangement of elements. (SCANS 6A, 6B, 7A, 7E)
20. Learn and demonstrate laboratory safety. (SCANS 6A, 6B, 7A, 7E)

CHT - 122 CHEMICAL CALCULATIONS I

1. Solve problems applying the "order of operations". (SCANS 6C, 7C)
2. Solve problems with the calculator involving the following keys: addition, subtraction, multiplication, division, memory, parenthesis, natural log, commonlog, exponential, factorial, inverse, square root, Xth root, exponential notation. (SCANS 1C, 5A, 5B, 6C)
3. Round answers to the proper number of significant figures. (SCANS 6C)

4. Express answers to the proper number of significant figures. (SCANS 6C)
5. Convert measurements of mass, length, and volume from English units to metric units, and vice versa. (SCANS 6C)
6. Calculate density, mass, length, and volume from appropriate data. (SCANS 6C)
7. Solve mole concept problems using the dimensional analysis method. (SCANS 3C, 6C, 7C)
8. Calculate atomic weight from Isotopic data. (SCANS 3C, 6C, 7C)
9. Determine molecular formulas from percent composition data. (SCANS 3A, 3C, 6C, 7C)
10. Balance equations by inspection. (SCANS 3A, 3C, 7A, 7C)
11. Balance equations by ion-electron half-reaction method. (SCANS 3A, 3C, 7A)
12. Balance equations by change in oxidation number methods. (SCANS 3A, 3C, 7A)

CHT - 124 GENERAL CHEMISTRY II

1. Determine the difference between ionic and covalent bonding by using the electronegativity table. (SCANS 3A, 3B, 3C, 4A, 6A, 6B, 7A, 7C, 7A, 7F)
2. Using the Periodic Table of elements, predict the type of bonding for chemical compounds. (SCANS 3A, 3B, 4A, 4B, 5A, 6A, 7A, 7B, 7D, 7F)
3. Determine through computation the frequency, energy, wavelength and concentration of electromagnetic radiation. (SCANS 3A, 3B, 6A, 6B, 6C, 7C)
4. Determine molecular weight, freezing point, and boiling point from colligative properties. (SCANS 1C, 3A, 3B, 4A, 4B, 5A, 5B, 6C, 7A, 7C)
5. Complete and balance chemical reactions of acids and bases. (SCANS 4A, 4B, 6B, 6C, 7A, 7C, 7F)
6. Calculate the hydrogen ion concentration given the pH of a solution. (SCANS 3A, B, C, 4A, B, 5A, B, 6C, 7A, 7C)
7. Predict the effect of temperature changes, pressure changes, concentration changes, and a catalyst on a chemical reaction, according to the Chatlier's principle. (SCANS 4A, 4B, 5A, 5B, 7A, 7C, 7F)
8. Calculate the equilibrium constant when given the concentration of reactant and products at equilibrium. (SCANS 3A, B, C, 4A, B, 5A, B, 6C, 7A, 7C)

CHT - 202 ORGANIC CHEMISTRY I

1. Given the organic structure of saturated hydrocarbons, give the IUPAC and/or common names. (SCANS 6A, 6B, 3A, 3C)
2. Given the IUPAC or common name of saturated hydrocarbons, write out structural formulas. (SCANS 6A, 6B, 3A, 3C)
3. Name and write structural formulas for members of unsaturated hydrocarbons, aromatic, alcohols, phenols, ethers, aldehydes, ketones, carboxylic acids and its derivatives. (SCANS 6A, 6B, 3A, 3C)

4. Synthesize organic compounds according to laboratory procedures and write a lab report. (SCANS 6A, 6B, 3B, 3C, 5A)
5. Operate infrared spectrophometer and refractometer. (SCANS 7C, 7F, 1C, 3A, 3C, 4A, 4B, 5A, 5B, 5C)
6. Name the different functional groups when given their structure. (SCANS 3C)
7. Write Lewis structures to represent a reaction mechanism. (SCANS 3A, 3C, 7A, 7F)
8. Write chemical equations for organic reactions. (SCANS 6B, 7A, 7F)
9. List differences between covalent compounds and ionic compounds. (SCANS 7A, 7F)
10. Identify types of bonds in organic compound. (SCANS 7C)

CHT - 204 CHEMICAL CALCULATIONS II

1. Balance equations and calculate stoichiometry problems. (SCANS 3A, 3C, 7A)
2. Define solute, solvent, solution. (SCANS 3C, 7A, 6B)
3. Calculate solution problems. (SCANS 6C)
4. Define equivalence point, end point, titration. (SCANS 3C, 7A, 6B)
5. Calculate problems in titration. (SCANS 6C, 7A, 7C)
6. Calculate colligative properties of solution problem. (SCANS 6C, 7A, 7C)
7. Define molecular equilibrium. (SCANS 6A, 6B, 7A)
8. Calculate molecular equilibrium problems. (SCANS 6C, 7C)
9. Define equilibrium constant. (SCANS 6A, 6B, 7A, 7F)
10. Calculate ionic equilibrium problems. (SCANS 6C, 7C)

CHT-206 ANALYTICAL CHEMISTRY I

1. Describe "Instrumental Techniques" and "Wet Techniques". (SCANS 6B, 7A, 7C)
2. Exhibit proper laboratory safety practices.(SCANS 2A, 8A, 8C, 8D, 8E)
3. Demonstrate good gravimetric laboratory skills. (SCANS 3B, 3C, 4A, 5B)
4. Practice proper sampling techniques. (SCANS 1C, 4A, 4B, 5A, 5B)
5. Demonstrate proper sample preparation techniques for common analysis. (SCANS 1C, 4A, 4B, 5A, 5B)
6. Determine the percent of a constituent in a given sample. (SCANS 3A, 3C, 6C, 7C)
7. Demonstrate proficiency in the use of gravimetric factors. (SCANS 3B, 3C, 4A, 5B)
8. Perform statistical analysis of data. (SCANS 3A, 3C, 6C, 7C)
9 Demonstrate knowledge of the variables and their effect on precipitate quality. (SCANS 3A, 3C, 6C, 7C)

CHT-207 ANALYTICAL CHEMISTRY II

1. Define titration. (SCANS 3A, 3C, 4A, 5A, 6B, 7F)
2. Prepare molar solutions. (SCANS 1C, 3A, 3B, 3C, 4A, 4B, 6C)
3. Identify and explain types of volummetric glassware. (SCANS 1C, 4A, 5A, 5B)
4. Calculate using equivalents, equivalent weights, and normality. (SCANS 6C, 7A, 7C)
5. Explain and identify Acid - Base Primary Standards. (SCANS 3A, 3B, 4A, 5A, 5B, 6B, 6E, 7A)
6. Calculate Percent constituent. (SCANS 6C, 7A, 7C)
7. Explain and calculate back titration. (SCANS 3A, 3B, 4A, 5A, 5B, 6B, 6E, 7A)
8. Sketch three titration curves when
   a. A weak acid is titrated with strong base
   b. A strong base titrated with strong acid (SCANS 3A, 3B, 3C, 4A, 4B,
   c. A weak base titrated with strong acid 5A, 5B, 6C, 6E, 7A, 7B, 7C)
9. Explain the role of indicators. (SCANS 4A, 6B, 6E, 7A, 7D)
10. Define complex ion. (SCANS 3A, 3C, 4A, 5A, 6B, 7F)
11. Determine a titration by the complexometric method. (SCANS 3A, 3B, 4A, 5A, 5B, 6B, 6E, 7A)
12. Define oxidation - reduction in reference to titration. (SCANS 3A, 3C, 4A, 5A, 6B, 7F)

CHT - 210 ANALYTICAL INSTRUMENTATION I

1. Describe the fundamental theories that govern performance of Gas Chromatogrpahic Columns. (SCANS: 1C, 3A, 3C, 4A, 5A, 5B, 6A, 6B, 6C, 7B, 7D)
2. Prepare analytical standards, calibrate a G.C., and quantitate unknown samples within 10% of their true value. (SCANS: 1C, 2C, 3A, 3C, 4A, 4B, 4C, 5A, 5B, 5C, 6A, 6C, 7A, 7B, 7C, 7D)
3. Perform temperature-programmed analysis of a complex sample and determine concentrations in an unknown sample within 10% of the true concentration. (SCANS: 1C, 2A, 2C, 3A, 3B, 3C, 3D, 4A, 4B, 4C, 5A, 5B, 5C, 6A, 6C, 7A, 7B, 7C, 7D)
4. Describe the operating principles and response characteristics of four G.C. detectors. (SCANS: 1C, 3A, 3C, 4A, 5A, 5B, 6A, 6B, 6C, 7B, 7D)
5. Describe the operating principle of an Atomic Absorption Spectrophotometer. (SCANS: 1C, 3A, 3C, 4A, 5A, 5B, 6A, 6B, 6C, 7B, 7D)
6. Prepare calibration standards for Atomic Absorption analysis by diluting certified materials with calibrated glassware. Analyze an unknown sample and determine concentration within 25% of the true concentration. (SCANS: 1C, 2C, 3A, 3C, 4A, 4B, 4C, 5A, 5B, 5C, 6A, 6C, 7A, 7B, 7C, 7D)

7. Operate a kinematic viscosity bath and determine the viscosity of a fluid using a bath and calibrated viscometers. (SCANS: 1C, 2A, 2C, 3A, 3B, 3C, 3D, 4A, 4B, 4C, 5A, 5B, 5C, 6A, 6C, 7A, 7B, 7C, 7D)
8. Prepare and verify the pH of a buffer solution using two different pH meters. (SCANS: 1C, 2C, 3A, 3C, 4A, 4B, 4C, 5A, 5B, 5C, 6A, 6C, 7A, 7B, 7C, 7D)
9. Calibrate a pH meter with certified buffer solutions and measure the pH of a variety of samples. (SCANS: 1C, 2A, 2C, 3A, 3B, 3C, 3D, 4A, 4B, 4C, 5A, 5B, 5C, 6A, 6C, 7A, 7B, 7C, 7D)
10. Describe the concept of pH and the various types of electrodes which are used to determine hydrogen ion concentration in aqueous solution. (SCANS: 1C, 3A, 3C, 4A, 5A, 5B, 6A, 6B, 6C, 7B, 7D)

CHT - 302 ANALYTICAL INSTRUMENTATION II

1. Calibrate of the following Gas Chromatographs.
   a. HP 5890A
   b. HP 5830 (1A, 1C, 3D, 4A, 4B, 4C, 5A, 5B. C, 7A, 7C, 7F)
   c. Perkin Elmer Sigma 3
   d. Varian 3700
2. Prepare Working Standards from Dilute and Intermediate Standards. (1C, 4A, 5A, 5B, 7B, 7D)
3. Prepare Working Standards both Single Component or Multi-component from 100% purity stock standards. (1C, 4A, 5A, 5B, 7B, 7D)
4. Perform serial dilutions and calculate dilution volume, dilution fractions, and concentrations of solutions based on dilution volume. (1C, 4A, 5A, 5B, 7B, 7D)
5. Calibrate the strip chart recorder and the HP3390A integrator. (1A, 1C, 3D, 4A, 4B, 4C, 5A, 5B, 5C, 7A, 7C, 7F)
6. Calibrate all parameters of the Atomic Absorption Spectrophotometer to achieve optimum absorbance for a variety of metals. (1A, 1C, 3D, 4A, 4B, 4C, 5A, 5B, 5C, 7A, 7C, 7F)
7. Calibrate the Infrared Spectrophotometer for the analysis of solids and liquids. (1A, 1C, 3D, 4A, 4B, 4C, 5A, 5B, 5C, 7A, 7C, 7F)
8. Familiarity of Quality Assurance and Quality Control Principles. (1A,1D, 2A, 2B, 2C, 2F, 3A, 3B, 3C, 3D, 4A, 4B, 5A, 5B, 5C)
9. Complete QA/QC Control Charts for each procedures. (1A,1D, 2A, 2B, 2C, 2F, 3A, 3B, 3C, 3D, 4A, 4B, 5A, 5B, 5C)

ENVIRONMENTAL TECHNOLOGY CURRICULUM
Laboratory Analysis & Environmental Sampling
(SEMESTERS)

			PERIODS PER WEEK			
FIRST SEMESTER			LEC.	LAB	SCH	CR.
ENV	100	Introduction to Environmental Technology	1	0	16	1
ENGL	1301	Composition I	3	0	48	3
MATH	1314	College Algebra	3	0	48	3
CHT	121	General Chemistry & Calculations I	3	6	144	5
IMT	1013	Intro. to Computer Applications	3	3	96	4
			13	9	352	16
SECOND SEMESTER						
ENV	115	Safety, Cleanup of HAZMAT & Response	4	4	128	5
SPCH	1311	Introduction to Speech	3	0	48	3
CHT	125	General Chemistry & Calculations II	3	6	144	5
MATH	1342	Statistics	3	0	48	3
			13	10	368	16
SUMMER SESSION						
GEN. Ed. Elective			3	0	48	3
PSYC	2301	General Psychology	3	0	48	3
			6	0	96	6
THIRD SEMESTER						
CHEM	301	Organic Chemistry I	3	3	96	4
CHT	205	Analytical Chemistry - Gravimetric & Volumetric	3	3	96	4
ENV	215	Sampling, Characterization & Analysis	3	3	96	4
ENV	235	Environmental Toxicology	3	3	96	4
			12	12	384	16
FOURTH SEMESTER						
ENV	225	Sample Characterization and Instrumental Analysis	4	6	160	6
CHT	215	Analytical Instrumentation	4	6	160	6
ENV	245	Advanced Environmental Analysis and QA/QC in the Laboratory	4	6	160	6
			12	18	480	18

Total Lecture Hours	56
Total Lab Hours	49
Total Credit Hours	72
Total Contact Hours	1680

COURSE DESCRIPTIONS
(SEMESTER)

ENV - 100 Introduction to Environmental Technology (Laboratory Analysis and Environmental Sampling) (1-0-1)

This course is an orientation to Environmental Technology. The local, state and national environmental concerns, as well as the laws and regulations governing industrial permits and compliance will be included. The course addresses the employment prospects of an environmental technician and their responsibilities. The U.S. Department of Labor Secretary's Commission on Achieving Necessary Skills (SCANS) will be introduced. A written report will be required.

ENV - 115 Safety, Cleanup of HAZMAT & Response (4-4-5)

This course addresses environmental safety from the perspective of workplace safety and incident first responder responsibilities. The course specifically covers laboratory safety requirements, Hazard Communication Act (HAZCOM), Spill Control, Cleanup, Disposal and Reporting. The course also certifies the completer as a first responder by covering the applicable 29CFR and the 40 Hour training requirement including Material Safety Data Sheets (MSDS), toxicology, monitoring, spill control, contingency planning and site safety.

ENV - 215 Sampling, Characterization & Analysis (3-3-4)

This course is a study of regulations, protocols, and procedures for the collection and storage of air, soil, and liquid samples including Quality Assurance/Quality Control, site selection, and sample preservation. Additionally, this course the characterization of samples by addressing the laboratory procedures for the determination of a samples physical and chemical properties to include colorimetric analysis, pH, turbidity, conductivity, BOD, COD, and specific gravity using kits and analytical instruments. Formal reports will be required for all experiments conducted.
Pre-requisites: ENV - 115 and CHT - 125

ENV - 225 Sample Characterization and Instrumental Analysis (4-6-6)

This course is a continuation of ENV - 215 completing the characterization and Analytical requirements established by ENV - 215 and including the use of EPA approved methods for the analysis of Environmental Samples using more sophisticated instruments. The course will specifically address the extraction and calibration requirements for analysis using Gas Chromatographs, Infrared Spectrophotometers, Inductively Coupled Plasma Spectrophotometry, Atomic Absorption Spectrophotometry and High Performance Liquid Chromatography. Formal reports will be required for all experiments conducted. Pre-requisites: ENV - 215 and CHT - 205

ENV - 235 Environmental Toxicology (3-3-4)

This course addresses toxicity and toxicology as it pertains to the environmental effects on plants and animals. The course addresses cell function, plant/animal dependence and the environment, the food chain, Bioassays, LD_{50} as well as environmental contamination. Specific attention is given to toxicological effects on target organs, the metabolic processes, and laboratory experimentation in Bioassays. Formal reports will be required for all experiments conducted.

ENV - 245 Advanced Environmental Analysis and QA/QC in the Laboratory (4-6-6)

This course is a continuation of ENV - 245 discussing regulatory and enforcement agencies and their authority. The course addresses more comprehensive analytical procedures such as Toxicity Characterization Leaching Procedure (TCLP), Polychlorinated Biphenyls (PCB) and includes Quality Assurance/Quality Control. Quality Assurance/Quality Control procedures are addressed including accuracy, precision, check and blank sample preparation and analysis, as well as the use of control charts. Statistical use of recovery using mean, standard deviation and coefficient of variance is discussed. Formal reports will be required for all experiments conducted. Pre-requisites: ENV - 215 and MATH - 1342

CHT - 121 General Chemistry & Calculations I (3-6-5)

This course introduces basic principles of scientific measurements, properties of matter, chemical nomenclature, chemical equations of elements and the necessary calculations necessary to support general chemistry concepts with special emphasis on problem solving. Additionally the course will emphasize oxidation-reduction equations and specific laboratory work in metric/English conversions, density, percent composition of elements, specific heat, and an additional seventeen experiments necessary to support theoretical concepts. A laboratory notebook will be kept and graded for compliance with industry standards. Co-requisite: College Algebra and Composition I

CHT - 125 General Chemistry & Calculations II (3-6-5)

This course introduces the theories and principles of bonding, spectroscopy, solutions acids-bases and equilibria. Laboratory work reinforces basic laboratory skills and introduces basic analytical instruments including twenty (20) laboratory experiments. Additionally, the course includes the calculation processes necessary for stoichiometry, solutions, titrations, and equilibrium. A laboratory notebook will be kept and graded for compliance with industry standards. Pre-requisites: CHT - 121 and MATH - 1314

CHT - 205 Analytical Chemistry Gravimetric & Volumetric Analysis (3-6-5)

This course includes both gravimetric and volumetric analytical procedures including sample precipitation, neutralization titrations, complex formation titrations, theory/application of oxidation-reduction titrations and potentiometric titrations. A laboratory notebook will be kept and graded for compliance with industry standards. Pre-requisites: CHT - 125 and MATH - 1342

CHT - 215 Analytical Instrumentation (4-6-6)

This course is a detailed course covering the principles of operation, calibration, operator maintenance and standard/sample analysis on a Gas Chromatograph, Atomic Absorption Spectrophotometer, ASTM Distillation Apparatus, Kinematic Viscosity Bath, pH meters, Carle Fisher Moisture Analyzer (Autotitrator), High Performance Liquid Chromatograph, Ion Chromatograph, GC/MS and Infrared Spectrophotometer. Formal Reports will be written for each experiment conducted. A laboratory notebook will be kept and graded for compliance with industry standards. Pre-requisites: CHT -205 and ENV - 215

CHEM - 301 Organic Chemistry I (3-3-4)

This course presents an overview of the classification, characteristics, and structure of carbon compounds and introduces basic organic laboratory skills and procedures. A laboratory notebook will be kept and graded for compliance with industry standards. Pre-requisites: CHEM - 1412 or CHT - 1255

ENGL-1301 Composition I (4-0-3)

Principles and techniques of written composition, textual analysis, and critical thinking. Prerequisite: ENGL 091 or equivalent as determined by English placement test.

MATH-1314 College Algebra (4-0-3)

The study of complex numbers, exponential and logarithmic functions, inequalities, determinants and matrices, and sequences and series. The course includes non-linear systems of equations and higher-degree equations. Prerequisites: MATH 090 or equivalent determined by MATH Placement Test.

IMT-1013 Introduction to Computer Applications (2-4-3)

This course is an introduction to microcomputer operations and the use of application software. Microcomputer topics include word processing, spreadsheet analysis and data base. Topic reinforcement is accomplished through laboratory experience.

SPCH-1311 Introduction to Speech Communications (4-0-3)

Theories and practice of speech communication behavior in interpersonal, small group, and public communication situations.

MATH-1342 Statistics (4-0-3)

Presentation and interpretation of data, probability, sampling. Correlation and regression, analysis of variance, and use of statistical software. Prerequisite: MATH 1314.

PSYC-2301 General Psychology (4-0-3)

A survey of the major topics in psychology. Introduces the study of behavior and the factors that determine and affect behavior.

COURSE OBJECTIVES
(SEMESTER)

ENV-100 INTRODUCTION TO ENVIRONMENTAL TECHNOLOGY

1. State or write the curriculum requirements for the environmental technology program. (SCANS 3A, 4A, 6A, 6B, 7A)
2. Describe the primary environmental concerns at the local, state, and national level. (SCANS 3A, 3C, 7A, 7D, 7F)
3. State who is responsible for the environment at the local, state, and national level. (3A, 3C, 7E)
4. List the Environmental Regulatory Agencies affecting the local, state, and national concerns and regulations. (SCANS 3A, 3C)
5. List the principal laws affecting the environment especially Air, Soil, and Water. (SCANS 3A, 3C, 6A, 6B)
6. Describe what Permits are and what compliance means as they affect industry in Texas and the U.S. (SCANS 3A, 3C, 6B, 7A, 7D)
7. State who requires the skills that an Environmental Technician possesses and why: (SCANS 3A, 3C, 4A, 6D, 6E, 7C)
8. List the principal responsibilities and duties of an Environmental Laboratory technician. (SCANS 3A, 3C, 4A, 6D, 6E, 7C)
9. Define professional integrity and ethics. (SCANS 3A, 3C, 4A, 6B, 7F)
10. Describe the SCANS Report requirements. (SCANS 3A, 3C, 6B, 7A, 7D)

ENV-115 SAFETY, CLEANUP OF HAZMAT & RESPONSE

1. State who is responsible for safety in the workplace and the accident reporting procedures. (SCANS 1D, 2A, 2B, 3A, 3C, 8A, 8C, 8E)
2. Explain the importance of the HAZARD COMMUNICATION ACT. (SCANS 3A, 3C, 4A, 6B, 8A, 8C, 8D, 8E)
3. State the purpose of an MSDS and its use. (SCANS 3A, 3C, 8A, 8B, 8C, 8D, 8E)
4. Explain and demonstrate the use of Chemical Container Labels stating personal precautions, usage procedures, and storage. (SCANS 3A, 3C, 4A, 6B, 8A, 8C, 8D, 8E)
5. Explain what a Laboratory Contingency Plan should contain and its purpose. (SCANS 1C, 1D, 2A, 2B, 2C, 3A, 3B, 3C, 4A, 4B, 8)
6. List Spill Prevention considerations, control, and perform cleanup measures. (SCANS 1C, 1D, 2A, 2B, 2C, 3A, 3B, 3C, 4A, 4B, 8)
7. State the correct disposal procedures for chemical containers, waste chemicals, and chemical residue. (SCANS 1C, 3A, 4A, 4B, 5A, 8A, 8C, 8E)
8. Describe placards and explain their use. (SCANS 3A, 3C, 8A, 8B, 8C, 8D, 8E)
9. Explain the steps to follow in Hazardous Material Response and list the resources available. (SCANS 1C, 1D, 2A, 2B, 2C, 3A, 3B, 3C, 4A, 4B, 8)

COURSE OBJECTIVES - (SEMESTER)

10. Define LD_{50}, IDLH, and explain First Aid Procedures in the case of acute chemical exposure. SCANS (3A, 3C, 4A, 4B, 7F)
11. Identify the kinds and types of Fume Hoods necessary in the chemical laboratory. (SCANS 1A, 3A, 4A, 4C)
12. Donn a Self Contained Breathing Apparatus and a Personal Protective Equipment uniform correctly. (SCANS 1A, 5A, 5B, 8 All)
13. Correctly package and label Hazardous Material for shipment to a waste disposal site. (SCANS 1C, 3A, 4A, 4B, 5A, 5B, 7F, 8 All)
14. State what regulation requires HAZWOPER training. (SCANS 3A, 3C, 7D)
15. State the potential number of chemicals that exist as probable Hazardous Materials. (SCANS 6B, 7B)
16. List at least ten hazardous materials to which emergency response personnel may respond. (SCANS 6B, 7B)
17. State the methods of HAZMAT identification, placard use and requirements as well as placard application rules. (SCANS 3A, 4A, 6A, 6B, 6E, 7A)
18. Describe the bodily contamination routes of entry and first aid considerations. (SCANS 3A, 3C, 4A, 4B, 6B, 6E, 7A)
19. Define TLV-TWA, TLV-STEL, and TLV-C. (SCANS 3A, 3C, 4A, 4B, 6B, 6E, 7A)
20. Define solubility, specific gravity, LEL, and pH. (SCANS 3A, 3C, 4A, 4B, 6B, 6E, 7A)
21. Define and describe the Incident Control System and Span of Control. (SCANS 3A, 3C, 4A, 4B, 6B, 6E, 7A)
22. Name the general work zones and the six steps the Hazardous Materials incident. (SCANS 6B, 7B)
23. State and describe the OSHA regulations that require the use of personal protective equipment, PPE. (SCANS 6B, 7B)
24. Define the four levels of protection A, B, C, and D. (SCANS 3A, 3C, 4A, 4B, 6B, 6E, 7A)
25. State when SCBA-self contained breathing apparatus are required. (SCANS 3A, 3C, 4A, 4B, 6B, 6E, 7A)
26. List the decontamination steps required. (SCANS 6B, 7B)
27. Prepare a contingency plan with mutual support. (SCANS 3A, 4A, 6B, 7A, 7E, 7F)
28. Collect HAZMAT samples for analysis following correct procedures and Chain-of-Custody. (SCANS 1C, 1D, 2C, 3A, 4A, 4B, 4C, 5A, 5B, 8 All)
29. Package waste hazardous material for shipping following Department of Transportation guidelines. (SCANS 1C, 3A, 4A, 4B, 5A, 5B, 7F, 8 All)

COURSE OBJECTIVES - (SEMESTER)

ENV-215 SAMPLING CHARACTERIZATION & ANALYSIS

1. List the key environmental enforcement agencies in the U.S. and Texas. (SCANS 3A, 3C, 7D)
2. List the environmental substrates of concern addressed by environmental regulations. (SCANS 3A, 3C, 7D)
3. Define a permit, state why it is necessary and who the responsible entities are. (SCANS 3A, 3C, 6B, 7A, 7B)
4. Define compliance as it pertains to environment and describe the reporting procedures required by the regulating agencies. (SCANS 3A, 3C, 6B, 7A, 7B)
5. State why samples are collected, and list the sampling considerations that must be followed prior to sampling. (SCANS 3A, 4A, 6B, 7A, 7E, 7F)
6. List the quality control measures that must be taken prior to and during field sampling. (SCANS 4A, 4B, 7B, 7D)
7. List the various sampling containers and their specific use. (SCANS 3A, 3C, 7D)
8. List the sample site selection considerations necessary prior to sampling. (SCANS 3A, 3C, 7D, 4A, 4B)
9. State the label information necessary on each sample container. (SCANS 3A, 4A, 6B, 6E, 7A, 7E, 7F)
10. Define Chain-of-Custody and explain why it is necessary. (SCANS 3A, 3C, 6B, 7A, 7B)
11. List the steps required for collecting samples for water, soil, and air. (SCANS (SCANS 3A, 4A, 6B, 7A, 7E, 7F)
12. State the storage and preservation specifications for water, soil, and air samples. (SCANS 1A, 4A, 4B, 5A, 5B, 7F, 8A, 8D)
13. State the disposal criteria for soil, air, and water samples after analysis. (SCANS 1A, 4A, 4B, 5A, 5B, 7F, 8A, 8D)
14. Define Quality Assurance/Quality Control and state why it is so critical. (SCANS 1C, 1D, 3A, 3C, 4A, 4B, 5A, 5B, 6A, 6B, 6C, 7C, 7D, 8A, 8D, 8E)
15. Identify, clean, and store pre-used sample containers. (SCANS 1A, 3A, 3B, 4A, 5A, 5B)
16. Calibrate air, water, and soil sampling devices. (SCANS 1A, 4A, 4B, 5A, 5B)
17. Create a sampling plan for air, water, and soil sample collection. (SCANS 1C, 2B, 2C, 3A, 3C, 3D, 4A, 5A, 5B)
18. List the labeling and packaging specifications necessary for transporting samples. (SCANS 4A, 5A, 5B, 6A, 6B, 7D)
19. Name the principal regulations that affect water quality in the United States and Texas. (SCANS 3A, 3C, 6A, 6B, 7A, 7F)
20. List the sampling equipment necessary for the collection of air, soil, and water samples. (SCANS 1C, 3A, 3C, 4A)
21. List the preservation and storage specifications for collected air, soil, and water samples. (SCANS 1C, 3A, 3C, 4A, 4B, 5A, 5B)
22. Name the analytical procedures that exist for the analysis of air, soil, and water samples. (SCANS 3A, 3C, 4A, 5A, 5B, 7E)
23. Describe the sample extraction procedures for the analysis of air, soil, and water samples. (SCANS 3A, 3C, 4A, 5A, 5B, 6B, 6E, 7E)

COURSE OBJECTIVES - (SEMESTER)

24 List the instruments required for the physical analysis of air, soil, and water samples. (SCANS 1C, 3A, 3C, 4A)

25. Explain the necessary Quality Assurance/Quality Control procedures for the analysis of air, soil, and water samples. (SCANS 1C, 1D, 3A, 3C, 4A, 4B, 5A, 5B, 6A, 6B, 6C, 7B, 7C, 8A, 8D, 8E)

26. Present the data obtained from the analysis of assigned samples and defend the integrity of the equipment, technician, and the procedure used. (SCANS 1C, 3A, 3C, 4A, 4B, 5A, 5B, 6C, 7A, 7C, 7F, 8 All)

27. Calibrate a pH Meter and determine the pH of water, air, and soil samples. (SCANS 1A, 4A, 4B, 5A, 5B)

EVN-225 SAMPLE CHARACTERIZATION AND INSTRUMENTAL ANLYSIS

1. Determine the amount of suspended solids in a sample by weight. (SCANS 5A, 5B, 6C, 7C)
2. Calibrate a turbidometer, a conductivity meter, and determine the conductivity and turbidity of a sample. (SCANS 1A, 4A, 4B, 5A, 5B)
3. Determine the concentration of mono and polyatomic ions using ion selective electrodes. (SCANS 5A, 5B, 6C, 7C)
4. Use the Hach Analysis Kit to analyze samples for EPA approved methods. (Acidity, Alkalinity, Metals, Chloride, Conductivity, Cyanide, Fluoride, Hardness for Ca, Hardness for Ca and Mq, Iron, Lead, Manganese, OD, etc) SCANS 1C, 3A, 3B, 3C, 4A, 4B, 5A, 5B)
5. Prepare samples and determine Biological Oxygen Demand. (SCANS 5A, 5B, 6C, 7C)
6. Perform all the above mentioned analysis following required Quality Assurance and Quality Control Guidelines. (SCANS 1C, 1D, 3A, 3C, 4A, 4B, 5A, 5B, 6A, 6B, 6C, 7B, 7C, 8A, 8D, 8E)
7. Determine percent moisture, texture and structure in soil samples. (SCANS 5A, 5B, 6C, 7C)
8. Calibrate and use the Portable Volatile Gas Analyzer. (SCANS 1A, 4A, 4B, 5A, 5B)
9. Collect and analyze air samples using air traps. (SCANS 1C, 1D, 2C, 3A, 4A, 4B, 4C, 5A, 5B, 8 All)
10. Name the regulations affecting water, soil, and air quality. (SCANS 3A, 3C, 6A, 6B, 7A, 7F)
11. Describe the analytical procedrues of air, water, and soil for pesticides. (Name the Procedures) (SCANS 1C, 3A, 3B, 3C, 4A, 4B, 5A, 5B)
12. Name the pesticide chemical family groups commonly analyzed when monitoring air, soil, and water samples. (SCANS 6B, 7B)
13. Collect, preserve, and store environmental samples for analysis. (SCANS 1C, 4A, 4B, 5A, 5B, 8 All)
14. Extract soil, air, and water samples following the prescribed analytical procedures required by EPA for analysis. (SCANS 4All, 5All, 8 All)

15. Calibrate the Gas Chromatograph and detectors for the analysis of samples. (SCANS 1A, 4A, 4B, 5A, 5B)
16. Calibrate the Atomic Absorption Spectrophotometer for the analysis of samples for metals. (Flame and Graphite Furnace) (SCANS 1A, 4A, 4B, 5A, 5B)
17. Calibrate the High Performance Liquid Chromatograph and/or the Ion Chromatograph for the analysis of samples. (SCANS 1A, 4A, 4B, 5A, 5B)
18. Analyze air, water, and soil samples using the Gas Chromatograph, HPLC, and the Atomic Absorption Spectrophotometer. (SCANS 1C, 3A, 3B, 3C, 4A, 4B, 5A, 5B)
19. Prepare standards for the analysis of samples by GC, HPLC, and AA. (SCANS 1C, 3A, 3B, 4)
20. Establish a QA/QC plan for each different type of Analytical Procedure in GC, HPLC, and AA. (Spikes, Blanks, and Standards) (SCANS 1C, 1D, 3A, 3C, 4A, 4B, 5A, 5B, 6A, 6B, 6C, 7C, 7D, 8A, 8B, 8E)
21. Present and defend experimental data to the class and faculty for one report. (SCANS 1C, 3A, 3C, 4A, 4B, 5A, 5B, 6C, 7A, 7C, 7F, 8 All)
22. Assure Chain-of-Custody protocol is followed on all procedures performed on each sample. (SCANS 1A, 2A, 2C, 4A, 4B, 5A, 5B, 8 All)
23. Characterize samples, and analyze oil and grease samples. (SCANS 1C, 3A, 3B, 3C, 4A, 4B, 5A, 5B)

ENV-235 ENVIRONMENTAL TOXICOLOGY

1. Define Toxicity and Toxicology. (SCANS 3A, 3C, 6A, 6B)
2. Define or explain Environmental Toxicity and Environmental Toxicology. (SCANS 3A, 3C, 6A, 6B)
3. Compare and contrast the structure of an animal cell and a plant cell. (SCANS 3A, 3B, 3C, 6B, 7A, 7B, 7C, 7D, 7F)
4. Explain how a cell receives nourishment and discards waste. (SCANS 3A, 3B, 3C, 6B, 7A, 7B, 7C, 7D, 7F)
5. Explain how animals and plants depend on the environment. (SCANS 3A, 3B, 3C, 6B, 7A, 7B, 7C, 7D, 7F)
6. Describe the Food Chain and explain the environmental and toxicological effects within it. (SCANS 3A, 3B, 3C, 6B, 7A, 7B, 7C, 7D, 7F)
7. Define and Explain Bioassay and LD_{50}. (SCANS 3A, 3C, 6A, 6B)
8. List those agencies that regulate, establish, and enforce environmental contamination. (SCANS 4A, 4B, 6A, 6B, 6E, 7B, 7D, 7F, 8A)
9. List the key human target organs affected by toxic compounds and the symptoms that may be observed. (SCANS 4A, 4B, 6A, 6B, 6E, 7B, 7D, 7F, 8A)
10. Define Metabolism and explain why understanding this metabolic process is important. (SCANS 3A, 3C, 6A, 6B, 7A, 7B, 7C, 7D)
11. Collect samples from a Bioassay Project and analyze them by following the required protocols and procedures. (SCANS 1A, 1C, 2A, 2F, 3A, 3B, 3C, 4A, 4B, 5A, 5B, 5C, 6A, 6B, 7A, 7B, 7C, 7D, 8A, 8D, 8E)

COURSE OBJECTIVES - (SEMESTER)

ENV-245 ADVANCED ENVIRONMENTAL ANALYSIS AND QA/QC IN THE LABORATORY

1. Define the Resource Conservation Recovery Act, Clean Air Act, and the Clean Water Act. (SCANS 3A, 3C, 6B, 7A, 7B)
2. Define the Comprehensive Environmental Response Compensation and Liability Act (SUPERFUND). (SCANS 3A, 3C, 6B, 7A, 7B)
3. Describe the NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM - NPDES, Safe Drinking Water Act and the Federal Pollutant Control Act. (SCANS 3A, 3C, 6B, 7A, 7B)
4. Explain the reason for TCLP Analysis, EPA Method 1311. Total Characteristic Leaching Procedure. (SCANS 3A, 3C, 5A, 6A, 6B, 6E)
5. Define the Federal Insecticide Fungicide and Rodenticide Act (FIFRA) Pesticide Analytical Requirements. (SCANS 3A, 3C, 6B, 7A, 7B)
6. Extract a sample for the analysis of PCBs from air, water, soil, or oil samples. (SCANS 4 All, 5 All, 8 All)
7. Calibrate the Gas Chromatograph, High Performance Liquid Chromatograph, and the Atomic Absorption Spectrophotometer for the analysis of PCB, Pesticides, metals, and other specific priority pollutants. (SCANS 1A, 4A, 4B, 5A, 5B)
8. Establish and maintain an ongoing Quality Assurance/Quality Control program for the analysis of samples for pesticides, PCB and other assigned. (SCANS 1C, 1D, 3A, 3C, 4A, 4B, 5A, 5B, 6A, 6B, 6C, 7C, 7D, 8A, 8D, 8E)
9. Comply with Chain-of-Custody requirements in the analytical process for all samples analyzed. (SCANS 1A, 2A, 2C, 4A, 4B, 5A, 5B, 8 All)
10. Determine which detector will be used for each analysis required by the regulations discussed in this course. (SCANS 1C, 5A, 5B)
11. Prepare Standards from 100% purity or less-stock, Intermediate and Working Standards. (SCANS 3A, 3C, 4A, 4B, 5A, 5B, 8 All)
12. Explain why Quality Assurance and Quality Control are essential in the analysis of environmental samples to prove compliance with permit authorization. (SCANS 3A, 3C, 4A, 4B, 5A, 5B, 6A, 6B, 6E, 7F, 8A)
13. Define Interlaboratory Quality Control and Intralaboratory Quality Control. (SCANS 3A, 3C, 4A, 5A, 6B, 7F)
14. Define Accuracy and precision and support each definition by activities that occur in the laboratory. (SCANS 3A, 3C, 4A, 5A, 6B, 7F)
15. List those Quality Assurance and Quality Control items that affect equipment and instrumentation in he laboratory. (SCANS 4A, 4B, 6B, 6E)
16. List the QA/QC items that are required to support that results obtained from sample analysis are viable. (SCANS 4A, 4B, 6B, 6E)
17. Prepare Stock, Intermediate, and Working Standards from 100% purity or lower purity assayed standards. (SCANS 1C, 3A, 3B, 3C, 4A, 4B, 6C)
18. Prepare Combination standards to ug/ml or ng/ml concentrations from intermediate standards following QA/QC documentation guidelines. (SCANS 1C, 3A, 3B, 3C, 4A, 4B, 6C)

COURSE OBJECTIVES - (SEMESTER)

19. Collect a sample pool, assay it for background and prepare spike samples and blanks for use in the analysis of environmental samples. (SCANS 3A, 3B, 3C, 4A, 4B, 5A, 5B, 8 All)
20. Keep a laboratory notebook on every activity performed in the lab by yourself and your subordinates. (SCANS 1A, 3A, 3B, 3C, 3D, 4A, 4B, 5A, 5B, 6A, 6B, 6E)
21. Keep an equipment maintenance logbook and update it each time an instrument is re-calibrated, maintained or repaired. (SCANS 1A, 2A, 3A, 3B, 3C, 4A, 4B, 5A, 5B, 8 All)
22. Keep a Standard Preparation LOG for each stock, intermediate, and working standard prepared. (SCANS 1A, 2A, 3A, 3B, 3C, 4A, 4B, 5A, 5B, 8 All)
23. Keep a sample LOG that tracks every sample from arrival to the laboratory until the final report is generated and sample disposal is documented. (SCANS 1A, 2A, 3A, 3B, 3C, 4A, 4B, 5A, 5B, 8 All)

CHEMICAL TECHNOLOGY SUPPORT COURSES FOR ENVIRONMENTAL TECHNOLOGY OBJECTIVES (SEMESTERS)

CHT - 121 GENERAL CHEMISTRY & CALCULATIONS I

1. Identify and use basic laboratory equipment. (SCANS 1C, 4A, 5A, 5B)
2. Apply Scientific method in laboratory exercises. (SCANS 7A, 7F, 3A, 3B, 3C)
3. Format laboratory report using experimentally collected data. (SCANS 3A, 3B, 3C, 7A, 7F, 8A, 8B, 8D, 8E)
4. Convert measurements of mass, length, and volume from English units to metric units, and vice versa. (SCANS 6C, 7C, 3A)
5. Express answers to calculations with proper significant figure and scientific notation. (SCANS 6C, 7C)
6. Make temperature conversions using fahrenheit, Celsius and Kelvin scales. (SCANS 6C, 7C)
7. Calculate density, mass or volume of an object from appropriate data. (SCANS 6C, 7C, 7F)
8. Solve chemical calculations using dimensional analysis approach. (SCANS 6C, 7A, 7C, 7F)
9. Distinguish between elements, compounds, and mixtures. (SCANS 7A, 7B, 7E, 7F)
10. Write symbols or names for common elements. (SCANS 6A, 6B, 7F)
11. Differentiates molecules and ions. (SCANS 4A, 6A, 6B, 7A, 7B)
12. Identify physical and chemical properties and physical and chemical changes. (SCANS 4A, 6A, 6B, 7A, 7B)
13. Write formulas and name compounds. (SCANS 3C, 4A, 6A, 6B, 7A, 7B)
14. Write and balance chemical equations. (SCANS 3C, 4A, 6A, 6B, 7A, 7B)
15. Complete and balance basic types of chemical equations. (SCANS 3C, 4A, 6A, 6B, 7A, 7B)
16. Describe subatomic particles of an atom. (SCANS 6A, 6B, 7A, 7E)
17. Identify mass number and atomic number using periodic table. (SCANS 6A, 6B, 7A, 7E)
18. Write electron configuration and Lewis structures for an element. (SCANS 3C, 4A, 6A, 6B, 7A, 7B)
19. Describe periodic arrangement of elements. (SCANS 6A, 6B, 7A, 7E)
20. Learn and demonstrate laboratory safety. (SCANS 6A, 6B, 7A, 7E)
22. Solve problems applying the "order of operations". (SCANS 6C, 7C)
23. Solve problems with the calculator involving the following keys: addition, subtraction, multiplication, division, memory, parenthesis, natural log, commonlog, exponential, factorial, inverse, square root, Xth root, exponential notation. (SCANS 1C, 5A, 5B, 6C)
24. Round answers to the proper number of significant figures. (SCANS 6C)

25. Express answers to the proper number of significant figures. (SCANS 6C)
26. Convert measurements of mass, length, and volume from English units to metric units, and vice versa. (SCANS 6C)
27. Calculate density, mass, length, and volume from appropriate data. (SCANS 6C)
28. Solve mole concept problems using the dimensional analysis method. (SCANS 3C, 6C, 7C)
29. Calculate atomic weight from Isotopic data. (SCANS 3C, 6C, 7C)
30. Determine molecular formulas from percent composition data. (SCANS 3A, 3C, 6C, 7C)
31. Balance equations by inspection. (SCANS 3A, 3C, 7A, 7C)
32. Balance equations by ion-electron half-reaction method. (SCANS 3A, 3C, 7A)
33. Balance equations by change in oxidation number methods. (SCANS 3A, 3C, 7A)

CHT - 125 GENERAL CHEMISTRY & CALCULATIONS II

1. Determine the difference between ionic and covalent bonding by using the electronegativity table. (SCANS 3A, 3B, 3C, 4A, 6A, 6B, 7A, 7C, 7A, 7F)
2. Using the Periodic Table of elements, predict the type of bonding for chemical compounds. (SCANS 3A, 3B, 4A, 4B, 5A, 6A, 7A, 7B, 7D, 7F)
3. Determine through computation the frequency, energy, wavelength and concentration of electromagnetic radiation. (SCANS 3A, 3B, 6A, 6B, 6C, 7C)
4. Determine molecular weight, freezing point, and boiling point from colligative properties. (SCANS 1C, 3A, 3B, 4A, 4B, 5A, 5B, 6C, 7A, 7C)
5. Complete and balance chemical reactions of acids and bases. (SCANS 4A, 4B, 6B, 6C, 7A, 7C, 7F)
6. Calculate the hydrogen ion concentration given the pH of a solution. (SCANS 3A, B, C, 4A, B, 5A, B, 6C, 7A, 7C)
7. Predict the effect of temperature changes, pressure changes, concentration changes, and a catalyst on a chemical reaction, according to the Chatlier's principle. (SCANS 4A, 4B, 5A, 5B, 7A, 7C, 7F)
8. Calculate the equilibrium constant when given the concentration of reactant and products at equilibrium. (SCANS 3A, B, C, 4A, B, 5A, B, 6C, 7A, 7C)
9. Balance equations and calculate stoichiometry problems. (SCANS 3A, 3C, 7A)
10. Define solute, solvent, solution. (SCANS 3C, 7A, 6B)
11. Calculate solution problems. (SCANS 6C)
12. Define equivalence point, end point, titration. (SCANS 3C, 7A, 6B)
13. Calculate problems in titration. (SCANS 6C, 7A, 7C)
14. Calculate colligative properties of solution problem. (SCANS 6C, 7A, 7C)
15. Define molecular equilibrium. (SCANS 6A, 6B, 7A)
16. Calculate molecular equilibrium problems. (SCANS 6C, 7C)

17. Define equilibrium constant. (SCANS 6A, 6B, 7A, 7F)
18. Calculate ionic equilibrium problems. (SCANS 6C, 7C)

CHT - 205 ANALYTICAL CHEMISTRY GRAVIMETRIC & VOLUMETRIC ANALYSIS (3-6-5)

1. Describe "Instrumental Techniques" and "Wet Techniques". (SCANS 6B, 7A, 7C)
2. Exhibit proper laboratory safety practices.(SCANS 2A, 8A, 8C, 8D, 8E)
3. Demonstrate good gravimetric laboratory skills. (SCANS 3B, 3C, 4A, 5B)
4. Practice proper sampling techniques. (SCANS 1C, 4A, 4B, 5A, 5B)
5. Demonstrate proper sample preparation techniques for common analysis. (SCANS 1C, 4A, 4B, 5A, 5B)
6. Determine the percent of a constituent in a given sample. (SCANS 3A, 3C, 6C, 7C)
7. Demonstrate proficiency in the use of gravimetric factors. (SCANS 3B, 3C, 4A, 5B)
8. Perform statistical analysis of data. (SCANS 3A, 3C, 6C, 7C)
9. Demonstrate knowledge of the variables and their effect on precipitate quality. (SCANS 3A, 3C, 6C, 7C)
10. Define titration. (SCANS 3A, 3C, 4A, 5A, 6B, 7F)
11. Prepare molar solutions. (SCANS 1C, 3A, 3B, 3C, 4A, 4B, 6C)
12. Identify and explain types of volummetric glassware. (SCANS 1C, 4A, 5A, 5B)
13. Calculate using equivalents, equivalent weights, and normality. (SCANS 6C, 7A, 7C)
14. Explain and identify Acid - Base Primary Standards. (SCANS 3A, 3B, 4A, 5A, 5B, 6B, 6E, 7A)
15. Calculate Percent constituent. (SCANS 6C, 7A, 7C)
16. Explain and calculate back titration. (SCANS 3A, 3B, 4A, 5A, 5B, 6B, 6E, 7A)
17. Sketch three titration curves when
    a. A weak acid is titrated with strong base
    b. A strong base titrated with strong acid (SCANS 3A, 3B, 3C, 4A, 4B,
    c. A weak base titrated with strong acid 5A, 5B, 6C, 6E, 7A, 7B, 7C)
18. Explain the role of indicators. (SCANS 4A, 6B, 6E, 7A, 7D)
19. Define complex ion. (SCANS 3A, 3C, 4A, 5A, 6B, 7F)
20. Determine a titration by the complexometric method. (SCANS 3A, 3B, 4A, 5A, 5B, 6B, 6E, 7A)
21. Define oxidation - reduction in reference to titration. (SCANS 3A, 3C, 4A, 5A, 6B, 7F)

CHT - 215 ANALYTICAL INSTRUMENTATION (4-6-6)

1. Describe the fundamental theories that govern performance of Gas Chromatogrpahic Columns. (SCANS: 1C, 3A, 3C, 4A, 5A, 5B, 6A, 6B, 6C, 7B, 7D)
2. Prepare analytical standards, calibrate a G.C., and quantitate unknown samples within 10% of their true value. (SCANS: 1C, 2C, 3A, 3C, 4A, 4B, 4C, 5A, 5B, 5C, 6A, 6C, 7A, 7B, 7C, 7D)
3. Perform temperature-programmed analysis of a complex sample and determine concentrations in an unknown sample within 10% of the true concentration. (SCANS: 1C, 2A, 2C, 3A, 3B, 3C, 3D, 4A, 4B, 4C, 5A, 5B, 5C, 6A, 6C, 7A, 7B, 7C, 7D)
4. Describe the operating principles and response characteristics of four G.C. detectors. (SCANS: 1C, 3A, 3C, 4A, 5A, 5B, 6A, 6B, 6C, 7B, 7D)
5. Describe the operating principle of an Atomic Absorption Spectrophotometer. (SCANS: 1C, 3A, 3C, 4A, 5A, 5B, 6A, 6B, 6C, 7B, 7D)
6. Prepare calibration standards for Atomic Absorption analysis by diluting certified materials with calibrated glassware. Analyze an unknown sample and determine concentration within 25% of the true concentration. (SCANS: 1C, 2C, 3A, 3C, 4A, 4B, 4C, 5A, 5B, 5C, 6A, 6C, 7A, 7B, 7C, 7D)
7. Operate a kinematic viscosity bath and determine the viscosity of a fluid using a bath and calibrated viscometers. (SCANS: 1C, 2A, 2C, 3A, 3B, 3C, 3D, 4A, 4B, 4C, 5A, 5B, 5C, 6A, 6C, 7A, 7B, 7C, 7D)
8. Prepare and verify the pH of a buffer solution using two different pH meters. (SCANS: 1C, 2C, 3A, 3C, 4A, 4B, 4C, 5A, 5B, 5C, 6A, 6C, 7A, 7B, 7C, 7D)
9. Calibrate a pH meter with certified buffer solutions and measure the pH of a variety of samples. (SCANS: 1C, 2A, 2C, 3A, 3B, 3C, 3D, 4A, 4B, 4C, 5A, 5B, 5C, 6A, 6C, 7A, 7B, 7C, 7D)
10. Describe the concept of pH and the various types of electrodes which are used to determine hydrogen ion concentration in aqueous solution. (SCANS: 1C, 3A, 3C, 4A, 5A, 5B, 6A, 6B, 6C, 7B, 7D)
11. Calibrate the following Gas Chromatographs.
    a. HP 5890A
    b. HP 5830 (1A, 1C, 3D, 4A, 4B, 4C, 5A, 5B, 5C, 7A, 7C, 7F)
    c. Perkin Elmer Sigma 3
    d. Varian 3700
12. Prepare Working Standards from Dilute and Intermediate Standards. (1C, 4A, 5A, 5B, 7B, 7D)
13. Prepare Working Standards both Single Component or Multi-component from 100% purity stock standards. (1C, 4A, 5A, 5B, 7B, 7D)
14. Perform serial dilutions and calculate dilution volume, dilution fractions, and concentrations of solutions based on dilution volume. (1C, 4A, 5A, 5B, 7B, 7D)
15. Calibrate the strip chart recorder and the HP3390A integrator. (1A, 1C, 3D, 4A, 4B, 4C, 5A, 5B, 5C, 7A, 7C, 7F)

16. Calibrate all parameters of the Atomic Absorption Spectrophotometer to achieve optimum absorbance for a variety of metals. (1A, 1C, 3D, 4A, 4B, 4C, 5A, 5B, 5C, 7A, 7C, 7F)
17. Calibrate the Infrared Spectrophotometer for the analysis of solids and liquids. (1A, 1C, 3D, 4A, 4B, 4C, 5A, 5B, 5C, 7A, 7C, 7F)
18. Familiarity of Quality Assurance and Quality Control Principles. (1A,1D, 2A, 2B, 2C, 2F, 3A, 3B, 3C, 3D, 4A, 4B, 5A, 5B, 5C)
19. Complete QA/QC Control Charts for each procedures. (1A,1D, 2A, 2B, 2C, 2F, 3A, 3B, 3C, 3D, 4A, 4B, 5A, 5B, 5C)

CHEM - 301 ORGANIC CHEMISTRY

1. Given the organic structure of saturated hydrocarbons, give the IUPAC and/or common names. (SCANS 6A, 6B, 3A, 3C)
2. Given the IUPAC or common name of saturated hydrocarbons, write out structural formulas. (SCANS 6A, 6B, 3A, 3C)
3. Name and write structural formulas for members of unsaturated hydrocarbons, aromatic, alcohols, phenols, ethers, aldehydes, ketones, carboxylic acids and its derivatives. (SCANS 6A, 6B, 3A, 3C)
4. Synthesize organic compounds according to laboratory procedures and write a lab report. (SCANS 6A, 6B, 3B, 3C, 5A)
5. Operate infrared spectrophometer and refractometer. (SCANS 7C, 7F, 1C, 3A, 3C, 4A, 4B, 5A, 5B, 5C)
6. Name the different functional groups when given their structure. (SCANS 3C)
7. Write Lewis structures to represent a reaction mechanism. (SCANS 3A, 3C, 7A, 7F)
8. Write chemical equations for organic reactions. (SCANS 6B, 7A, 7F)
9. List differences between covalent compounds and ionic compounds. (SCANS 7A, 7F)
10. Identify types of bonds in organic compound. (SCANS 7C)

GENERAL EDUCATION COURSES

Comptency Ratings vs. Existing Course Offerings 2.4 to 3.0	Engl 1301 Comp I	Math 1314 College Alg. I	Psyc 2301 or Soci 1301	Elective	Engl 1302 Comp II	G E. Open Math Stats	G E. Open	G E. Open	IMT 1013 Intro to Computer
1. Practice laboratory & job safety 1.1									
17. Use good lab practice & standard operating procedures 1.1									
16. Apply QA/QC procedures 1.2						X			
6. Analyze samples in accordance with regulations 1.2									
5. Prepare Samples 1.3									
9. Calibrate & keep records of analyical instruments 1.3									
21. Manage Time 1.4									
22. Communicate effectively orally and in writing 1.5	X (P)				X (P)				

(P) = Partially Addressed

GENERAL EDUCATION COURSES

Competency Ratings vs. Existing Course Offerings 2.4 to 3.0	Engl 1301 Comp I	Math 1314 College Alg I	Psyc 2301 or Soci 1301	Elective	Engl 1302 Comp II	G.E. Open Math Stats	G.E. Open	G.E. Open	IMT 1013 Intro to Computer
2. Manage time 1.5									
19. Maintain records from collection to disposal of samples 1.5									
4. Perform sampling tasks from collection to disposal 1.5									
15. Interpret & evaluate data 1.6						X			
3. Prepare sample container 1.6									
7. Prepare reports 1.6					X				
20. Use personal computers 1.6					X				X
18. Present & defend analytical results 1.8									
12. Develop procedures and plans 1.9									

GENERAL EDUCATION COURSES

Comptency Ratings vs. Existing Course Offerings 2.4 to 3.0	Engl 1301 Comp I	Math 1314 College Alg. I	Psyc 2301 or Soci 1301	Elective	Engl 1302 Comp II	G.E. Open Math Stats	G.E. Open	G.E. Open	IMT 1013 intro to Computer
10. Maintain inventory of chemicals & reagents 1.9									
13. Train employees 1.9									
23. Drive safely 2.0									
10. Maintain & sterilize glassware 2.0									
24. Read flow sheets 2.3									
14. Arrange contract services 2.4									
23. Know & follow regualtions & protocol 2.8									

GENERAL EDUCATION COURSES

Pressing Needs vs Existing Course Offerings 2.0 to 2.6	Engl 1301 Comp I	Math 1314 College Alg I	Psyc 2301 or Soci 1301	Elective	Engl 1302 Comp II	G E Open Math 1342 Stats	G E Open	G E Open	IMT 1013 Intro to Computer
QA/QC 1.6						X (P)			
Knowledge of Regulations 1.6									
Organic & Analytical Chemistry 1.7									
Writing/communication skills 1.7	X				X				
Computer Skills 1.8					X				X
Ethical /Legal Responsibility 1.9									
Organizational Skills 1.9									
Math Skills 2.0		X				X			

(P) = Partially Addressed

EXISTING TECHNOLOGY COURSES

Comptency Ratings vs. Existing Course Offerings 2.4 to 3.0	CHT 120 General Chem. I	CHT 122 General Calc. I	CHT 124 General Chem. II	CHT 204 Chemical Calc. II	CHT 202 Organic Chem. I	CHT 206 Analytical Chem. Gravimetric	CHT 207 Analytical Chem. Volumetric	CHT 208 Organic Chem. II	CHT 210 Analytical Instr. I	CHT 302 Analytical Instr. II	CHT 308 Analytical Instr. II
1. Practice laboratory & job safety 1.1	X (P)		X (P)		X (P)	X (P)	X (P)	X (P)	X (P)	X (P)	X (P)
17. Use good laboratory practice & standard operating procedure 1.1	X		X		X	X	X	X	X	X	X
16. Apply QA/QC procedures 1.2						X (P)	X (P)	X (P)		X (P)	X (P)
6. Analyze samples in accordance with regulations 1.2											
5. Prepare samples 1.3								X (P)		X (P)	X (P)
9. Calibrate and keep records of analytical istuments 1.3									X (P)	X (P)	X (P)
21. Manage Time 1.4					X	X	X	X	X	X	X
22. Communicate effectively orally and in writing 1.5						X (WR)	X (WR)	X (WR)	X (WR)	X (WR)	X (WR)

(P) = Partially Addressed; (WR) = Written Report

EXISTING TECHNOLOGY COURSES

Competency Ratings vs. Existing Course Offerings 2.4 to 3.0	CHT 120 General Chem. I	CHT 122 General Calc. I	CHT 124 General Chemistry II	CHT 204 Chemical Calc. II	CHT 202 Organic Chem I	CHT 206 Analytical Chem. Gravimetric	CHT 207 Analytical Chem. Volumetric	CHT 208 Organic Chem. II	CHT 210 Analytical Instr. I	CHT 302 Analytical Instr. II	CHT 308 Analytical Instr. III
2. Prepare Reagents 1.5						X	X	X	X (P)	X	X
19. Maintain records from collection to disposal of samples 1.5										X (P)	X (P)
4. Perform sampling tasks from collection to disposal 1.5											
15. Interpret & evaluate data 1.6	X (P)	X (P)	X (P)		X (P)	X (P)	X (P)	X (P)		X (P)	
3. Prepare sample container 1.6											
7. Prepare reports 1.6								X (WR)	X (WR)	X (WR)	X (WR)
20. Use personal computers 1.6								X (WR)	X (WR)	X (WR)	X (WR)
18. Present & defend analytical results 1.8					X (P)	X (P)	X (P)		X	X	X
12. Develop procedures and plans 1.9										X (P)	X (P)

(P) = Partially Addressed; (WR) = Written Report

EXISTING TECHNOLOGY COURSES

Comptency Ratings vs. Existing Course Offerings 2.4 to 3.0	CHT 120 General Chem. I	CHT 122 General Chem. I	CHT 124 General Chem. II	CHT 204 Chemical Calc. II	CHT 202 Organic Chem. I	CHT 206 Analytical Chem. Gravimetric	CHT 207 Analytical Chem. Volumetric	CHT 208 Organic Chem. II	CHT 210 Analytical Instr. I	CHT 302 Analytical Instr. II	CHT 308 Analytical Instr. II
10. Maintain inventory of chemicals & reagents 1.9											
13. Train employees 1.9											
23. Drive safely 2.0											
8. Maintain & sterilize glassware 2.0										X (P)	X (P)
24. Read flow sheets 2.3											
14. Arrange contract services 2.4											
11. Know & follow regulations & protocol 2.8										X (P)	X (P)

(P) = Partially Addressed

EXISTING TECHNOLOGY COURSES

Equipment Use Ratings vs Existing Course Offerings 2.2 to 2.8		CHT 120 General Chem. I	CHT 124 General Chem. II	CHT 202 Organic Chem. I	CHT 206 Analytical Chem. I	CHT 207 Analytical Chem. II	CHT 208 Organic Chem. II	CHT 210 Analytical Instr. I	CHT 302 Analytical Instr. II	CHT 304 Unit Opns. I	CHT 308 Analytical Instr. III	CHT 310 Unit Opns. II
1. Analytical Balance	1.2	X	X	X	X	X	X	X	X	X	X	X
2. PH Meters	1.2					X		X	X		X	
5. Measuring Glassware (graduated & volumetric)	1.3	X	X	X	X	X	X	X	X	X	X	X
28. PC Computers	1.5							X	X		X	
6. Manual Titration Burette	1.6					X			X			
7. Macro-Micro pipettes	1.6								X		X	
3. Conductivity meters	1.6		X						X	X	X	
36. Sampling equipment	1.7											
23. Computer for wordprocessors, spreadsheets, graphics	1.7						X	X	X	X	X	X

EXISTING TECHNOLOGY COURSES

Equipment Use Ratings vs Existing Course Offerings 2.2 to 2.8	CHT 120 General Chem. I	CHT 124 General Chem. II	CHT 202 Organic Chem. I	CHT 206 Analytical Chem. I	CHT 207 Analytical Chem. II	CHT 208 Organic Chem. II	CHT 210 Analytical Instr. I	CHT 302 Analytical Instr. II	CHT 304 Unit Oprns. I	CHT 308 Analytical Instr. III	CHT 310 Unit Oprns. II
12. UV/VIS Spectrophotometer **1.7**		X					X	X	X	X	
9. Gas chromatograph **1.7**	X		X				X	X	X	X	X
35. Syringes **1.8**	X		X				X	X	X	X	X
25. TOC (Total Organic Carbon) **1.8**											
18. Atomic Absorption-Emmission Spectrometer **1.8**							X	X		X	
31. Mechanical tools, and identification **1.8**								X	X	X	X
27. DO meters (Dissolved Oxygen) **1.8**											
13. Infrared Spectrophotometers **1.9**			X			X	X	X		X	

EXISTING TECHNOLOGY COURSES

Equipment Use Ratings vs Existing Course Offerings 2.2 to 2.8	CHT 120 General Chem. I	CHT 124 General Chem. II	CHT 202 Organic Chem. I	CHT 206 Analytical Chem. I	CHT 207 Analytical Chem. II	CHT 208 Organic Chem. II	CHT 210 Analytical Instr. I	CHT 302 Analytical Instr. II	CHT 304 Unit Opns. I	CHT 308 Analytical Instr. III	CHT 310 Unit Opns. II
11. Purge & Trap sampling for chromatography 1.9											
22. Lab Inform. Mgmt Systm (LIMS) 1.9								X (P)		X (P)	
30. Extractors (TCLP) 2.0											
16. Automatic Samplers 2.0											
19. Inductivley Coupled Plasma Spectrophotometry 2.1											
29. Mass Spectrometry 2.1										X (I)	
4. Centrifuge 2.1											
17. Autotitrator (Moisture Analyzer) 2.2								X		X	

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[redacted] (P) [redacted] Part[redacted] Addr[redacted]; (I) [redacted] Produ[redacted]

EXISTING TECHNOLOGY COURSES

Equipment Use Ratings VS Existing Course Offerings 2.2 to 2.8	CHT 120 General Chem I	CHT 124 General Chem II	CHT 202 Organic Chem I	CHT 206 Analytical Chem I	CHT 207 Analytical Chem II	CHT 208 Organic Chem II	CHT 210 Analytical Instr I	CHT 302 Analytical Instr II	CHT 304 Unit Opns I	CHT 306 Analytical Instr III	CHT 310 Unit Opns II
8. Millipore Filtration for HPLC 2.2								X		X	
26. TOH Total Organic Halogen Analyzer 2.2											
14. HPLC High Performance Liquid Chromatograph 2.2								X (P)		X (P)	
33. Column Cleanup Chromatography (Florisil & Silica Gel) 2.3										X (P)	
34. Kaduma-Danish Evaporator 2.3											
15. Ion Chromatographs 2.3								X			
10. Photovac Portable P.I.D. 2.3											
32. Portable OVA-108 Gas Chromatograph 2.4											

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(P) = Partially Addressed

EXISTING TECHNOLOGY COURSES

Equipment Use Ratings VS Existing Course Offerings 2.2 to 2.8	CHT 120 General Chem. I	CHT 124 General Chem. II	CHT 202 Organic Chem. I	CHT 205 Analytical Chem. I	CHT 207 Analytical Chem. II	CHT 208 Organic Chem. II	CHT 210 Analytical Instr. I	CHT 302 Analytical Instr. II	CHT 304 Unit Opns I	CHT 308 Analytical Instr. III	CHT 310 Unit Opns II
21. Buchii Rotavapor **2.5**								X		X	
20. Kinematic Viscosity Bath and Viscometers **2.5**							X (P)	X (P)	X (P)	X (P)	X (P)
24. Gel Permeation **2.6**											

(P) = Partially Addressed

EXISTING TECHNOLOGY COURSES

Areas of Greatest Concern vs Existing Course Offering 2.4 to 2.7		CHT 120 General Chem. I	CHT 124 General Chem. II	CHT 202 Organic Chem. I	CHT 206 Analytical Chem. I	CHT 207 Analytical Chem. II	CHT 208 Organic Chem. II	CHT 210 Analytical Instr. I	CHT 302 Analytical Instr. II	CHT 304 Unit Opns. I	CHT 310 Unit Opns. II	CHT 308 Analytical Instr. III
Hazardous Materials	1.3											
Monitoring and Testing	1.4					X (P)			X (P)			X (P)
Water Quality	1.4					X (P)			X (P)			X (P)
Air Quality	1.5											
Solid Waste	1.5											
Occupational Safety	1.5											
Environmental Policy	1.7											
Water Management	1.8											
Permitting	1.8											

(P) = Partially Addressed

EXISTING TECHNOLOGY COURSES

Areas of Greatest Concern vs Existing Course Offering 2.4 to 2.7	CHT 120 General Chem. I	CHT 124 General Chem. II	CHT 202 Organic Chem. I	CHT 206 Analytical Chem. I	CHT 207 Analytical Chem. II	CHT 208 Organic Chem. II	CHT 210 Analytical Instr. I	CHT 302 Analytical Instr. II	CHT 304 Unit Opns. I	CHT 310 Unit Opns II	CHT 306 Analytical Instr. III
Sanitation/Environmental 1.9											
Emergency Response 1.9											
Energy 2.3											
Land Use Policy 2.3											
Asbestos 2.4											
Pest Control 2.7											

EXISTING TECHNOLOGY COURSES

Pressing Needs vs Existing Course Offering 2.0 to 2.6	CHT 120 General Chem I	CHT 124 General Chem II	CHT 202 Organic Chem I	CHT 206 Analytical Chem I	CHT 207 Analytical Chem II	CHT 208 Organic Chem II	CHT 210 Analytical Instr I	CHT 302 Analytical Instr II	CHT 304 Unit Opns I	CHT 310 Unit Opns II	CHT 308 Analyticall nstr III
QA/QC 1.6				X (P)	X (P)			X			X
Knowledge of Regulations 1.6								X (P)			X (P)
Organic & Analytical Chemistry 1.7			X	X	X	X	X	X			X
Writing/communication skills 1.7	X (P)	X (P)	X (P)	X (P)	X (P)	X (P)	X	X	X	X	X
Computer Skills 1.8						X (P)	X (P)	X (P)	X (P)	X (P)	X (P)
Ethical /Legal Responsibility 1.9								X (P)			X (P)
Organizational Skills 1.9		P				P		P			P
Math Skills 2.0				X (P)	X (P)			X (P)			X (P)

(P) = Partially Addressed

ENVIRONMENTAL TECHNOLOGY COURSES

Comptency Ratings vs. Environmental Course Offenngs	ENV - 100	ENV - 110	ENV-210	ENV - 220	ENV - 310	ENV - 320	ENV - 340	ENV - 350	ENV - 390 Seminar
1. Practice laboratory & job safety 1.1	X	X	X	X	X	X	X	X	X
17. Use good lab practice & standard operating procedures 1.1		X	X	X	X	X	X	X	X
16. Apply QA/QC procedures 1.2		X	X	X	X	X	X	X	X
6. Analyze samples in accordance with regulations 1.2		X	X	X	X	X	X	X	X
11. Know & follow regulations and protocols 1.3	X	X	X	X	X	X	X	X	X
5. Prepare samples 1.3		X	X	X	X	X	X	X	X
9. Calibrate & keep records of analytical instruments 1.3		X	X	X	X	X	X	X	X
21. Manage Time 1.4	X	(P)	(P)	(P)	(P)	(P)	(P)	(P)	(P)

(P) = Partially Addressed

ENVIRONMENTAL TECHNOLOGY COURSES

Comptency Ratings vs. Environmental Course Offerings	ENV - 100	ENV - 110	ENV - 210	ENV - 220	ENV -310	ENV -320	ENV - 340	ENV - 350	ENV - 390 Seminar
22. Communicate effectively orally and in writing 1.5		X	X	X	X	X	X	X	X
2. Prepare reagents 1.5		X	X	X	X	X	X	X	X
19. Maintain records from collection to disposal of samples 1.5		X	X	X	X	X	X	X	X
4. Perform Sampling tasks from collection to disposal 1.5		X	X	X	X	X	X	(P)	(P)
3. Prepare sample container 1.6		X	X	X	X				X
15. Interpret and evaluate data 1.6		X	X	X	X	X	X	X	X
20. Use personal computers 1.6			X	X	X	X	X	X	X
7. Prepare reports 1.6	X	X	X	X	X	X	X	X	X
18. Present and defend analytical results 1.8		X	X	X	X (P)	X (P)	X (P)	X (P)	X

(P) = Partially Addressed

ENVIRONMENTAL TECHNOLOGY COURSES

Comptency Ratings vs. Environmental Course Offerings	ENV - 100	ENV - 110	ENV - 210	ENV - 220	ENV - 310	ENV - 320	ENV - 340	ENV - 350	ENV - 390 Seminar
12. Develop procedures & plans 1.9									X
13. Train Employees 1.9									
23. Drive Safely 2.0	X								
10. Maintain inventory of chemicals & reagents 1.9									
8. Maintain & sterilize glassware 2.0		X	X	X	X	X	X	X	X
24. Read flow sheets 2.3									
14. Arrange contract services 2.4									

ENVIRONMENTAL TECHNOLOGY

Equipment Use Environmental Technology Courses	ENV - 100	ENV - 110	ENV - 210	ENV - 220	ENV -310	ENV - 320	ENV - 340	ENV - 350	ENV - 390 Seminar	ENV - Spec Proj	ENV - Co-Op
1. Analytical Balance 1.2		X	X	X	X	X	X	X		X	X
2. PH Meters 1.2		X	X	X	X	X	X	X		X	X
5. Measuring Glassware (graduated & volumetric) 1.3		X	X	X	X	X	X	X		X	X
28. PC Computers 1.5	X		X	X	X	X	X	X	X	X	
6. Manual Titration Burette 1.6			X	X						X	X
7. Macro-Micro pipettes 1.6			X	X	X	X	X	X	X	X	X
3. Conductivity Meters 1.6		X	X	X	X	X			X		X
36. Sampling equipment 1.7		X	X	X	X	X	X	X		X	X
12. UV/VIS Spectrophotometers 1.7		X	X	X	X	X	X	X	X	X	X

ENVIRONMENTAL TECHNOLOGY

Equipment Use Environmental Technology Courses	ENV - 100	ENV - 110	ENV - 210	ENV - 220	ENV - 310	ENV - 320	ENV - 340	ENV - 350	ENV-390 Seminar	ENV - Spec Proj	ENV - Co-Op
23. Computer for wordprocessors, spreadsheets, graphics 1.7		X	X	X	X	X	X	X	X	X	X
9. Gas Chromatograph 1.7				X	X	X	X	X	X	X	X
35. Syringes 1.8		X	X	X	X	X	X	X	X	X	X
25. TOC (Total Organic Carbon) 1.8				X			X	X		X	
18. Atomic Absorption-Emmission Spectrometer 1.8				X	X	X	X	X		X	X
31. Mechanical tools, and identification 1.8			X	X	X	X	X	X		X	
27. DO Meters (Dissolved Oxygen) 1.8		X	X						X	X	X
13. Infrared Spectrophotometers 1.9			X	X					X		X

ENVIRONMENTAL TECHNOLOGY

Equipment Use Environmental Technology Courses	ENV - 100	ENV - 110	ENV - 210	ENV - 220	ENV - 310	ENV - 320	ENV - 340	ENV - 350	ENV-390 Seminar	ENV - Spec Proj	ENV - Co-Op
11. Purge & Trap sampling for chromatography 1.9				X	X	X	X	X	X		
22. Lab Inform. Mgmt Systm (LIMS) 1.9				X	X	X	X	X	X	X	X
30. Extractors (TCLP) 2.0				X	X	X	X	X	X		X
16. Automatic Samplers 2.0				X	X	X	X	X			X
19. Inductivley Coupled Plasma Spectrophotometry 2.1				X	X	X	X	X			X
29. Mass Spectrometry 2.1				X	X	X	X	X			
4. Centrifuge 2.1			X	X	X	X	X	X	X		
17. Autotitrator (Moisture Analyzer) 2.2			X	X	X	X	X	X			

ENVIRONMENTAL TECHNOLOGY

Equipment Use Enviromental Technology Courses	ENV - 100	ENV - 110	ENV - 210	ENV - 220	ENV - 310	ENV - 320	ENV - 340	ENV - 350	ENV-390 Seminar	ENV - Spec Proj	ENV - Co-Op
8. Millipore Filtration for HPLC **2.2**			X	X	X	X	X	X			
26. TOH Total Organic Halogen Analyzer **2.2**				X	X						
14. HPLC High Performance Liquid Chromatograph **2.2**				X	X	X	X	X			
33. Column Cleanup Chromatography (Florisil & Silica Gel) **2.3**			X	X	X	X	X	X	X		
34. Kaduma-Danish Evaporator **2.3**				X	X	X	X	X			
15. Ion Chromatographs **2.3**				X	X	X	X	X			
10. Photovac Portable P.I.D. **2.3**		X	X		X	X	X	X			
32. Portable OVA-108 Gas Chromatograph **2.4**		X	X								X

ENVIRONMENTAL TECHNOLOGY

Equipment Use Environmental Technology Courses	ENV - 100	ENV - 110	ENV - 210	ENV - 220	ENV - 310	ENV - 320	ENV - 340	ENV - 350	ENV -390 Seminar	ENV - Spec Proj	ENV - Co-Op
21. Buchii Rotavapor 2.5				X	X	X	X	X			X
20. Kinematic Viscosity Bath & Viscometers 2.5			X	X	X	X	X	X			
24. Gel Permeation 2.6				X	X	X	X	X			

ENVIRONMENTAL TECHNOLOGY COURSES

Areas of Greatest Concern vs Environmental Course Offering		ENV - 100	ENV - 110	ENV - 210	ENV - 220	ENV - 310	ENV - 320	ENV - 340	ENV - 350	ENV - 390 Seminar
Hazardous Materials	1.3	X	X	(P)	(P)	(P)	X	(P)	(P)	X
Monitor and Testing	1.4	X	X	X	X	X	X	X	X	X
Water Quality	1.4	X	X	X	X	X	X	X	X	(P)
Air Quality	1.5	X	X	X	X	X	X	X	X	(P)
Solid Waste	1.5	X	X	(P)	(P)	(P)	X	X	X	(P)
Occupational Safety	1.5	X	X	X	X	(P)	(P)	(P)	(P)	X
Environmental Policy	1.7	X	X	X	X	X	X	X	X	X
Water Management	1.8	(P)	(P)	(P)	(P)	(P)	(P)	(P)	(P)	(P)
Permitting	1.8	(P)	(P)	(P)	(P)	(P)	(P)	(P)	(P)	(P)

(P) = Partially Addressed

ENVIRONMENTAL TECHNOLOGY COURSES

Areas of Greatest Concern vs Environmental Course Offering		ENV - 100	ENV - 110	ENV - 210	ENV - 220	ENV - 310	ENV - 320	ENV - 340	ENV - 350	ENV - 390 Seminar
Sanitation/Environmental	1.9	X	X	X	X	(P)	X	X	X	(P)
Emergency Response	1.9	X	X			X	X			
Energy	2.3	P					P	P	P	
Land Use Policy	2.3									
Asbestos	2.4									X
Pest Control	2.7	P			X (P)	X (P)	X (P)		X (P)	X (P)

(P) = Partially Addressed

ENVIRONMENTAL TECHNOLOGY COURSES

Pressing Needs vs Environmental Course Offering	ENV - 100	ENV - 110	ENV - 210	ENV - 220	ENV - 310	ENV - 320	ENV - 340	ENV - 350	ENV - 390 Seminar
QA/QC **1.6**	X	X	X	X	X	X	X	X	X
Knowledge of Regulations **1.6**	X	X	X	X	X	X	X	X	X
Organic & Analytical Chemistry **1.7**		X	X	X	X	X	X	X	X
Writing/communication skills **1.7**	X	X	X	X	X	X	X	X	X
Computer Skills **1.8**		X	X	X	X	X	X	X	X
Ethical /Legal Responsibility **1.9**	X	X	X	X	X	X	X	X	X
Organizational Skills **1.9**		X	X	X	X	X	X	X	
Math Skills **2.0**		X	X	X	X	X	X	X	X

ENVIRONMENTAL TECHNOLOGY
(Laboratory Analysis and Environmental Sampling)

APPENDIX F

Tables, Charts and Comparisons by Groups of Final Results

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Analysis of Need for Environmental Technicians (Laboratory Analysis and Environmental Sampling)

Next Five Years

Need as summarized from the 161 responses used:

	Private Labs	Texas Manuf.	Valley Manuf.	Total
Lab. Analysts	444	111	13	568
Env. Sampling	211	52	13	276
Total	655	163	26	844

Need as generalized to the approximate systematic sample:

	Private Labs	Texas Manuf.	Valley Manuf.	Total
Lab. Analysts	1644	528	81	2253
Env. Sampling	781	248	81	1110
Total	2425	776	162	3363

Need as generalized to the total population:

	Private Labs	Texas Manuf.	Valley Manuf.	Total
Lab. Analysts	1644	5280	675	7599
Env. Sampling	781	2480	675	3936
Total	2425	7760	1350	11535

Comparison of Minimum Level of Education for Entry Level Environmental Technicians (Laboratory Analysis and Environmental Sampling)

Laboratory Analyst

	4-Yr	2-Yr	H.S.	Other
Manufacturers Outside RGV	8	29	15	0
Private Laboratories	18	27	16	2
Manufacturers in RGV	4	1	3	0

Environmental Sampling

	4-Yr	2-Yr	H.S.	Other
Manufacturers Outside RGV	9	20	19	0
Private Laboratories	11	21	22	2
Manufacturers in RGV	3	3	2	0

Note:
4-Yr - Four-Year College or University
2-Yr- Two-Year Technical or Community College
H.S. - High School

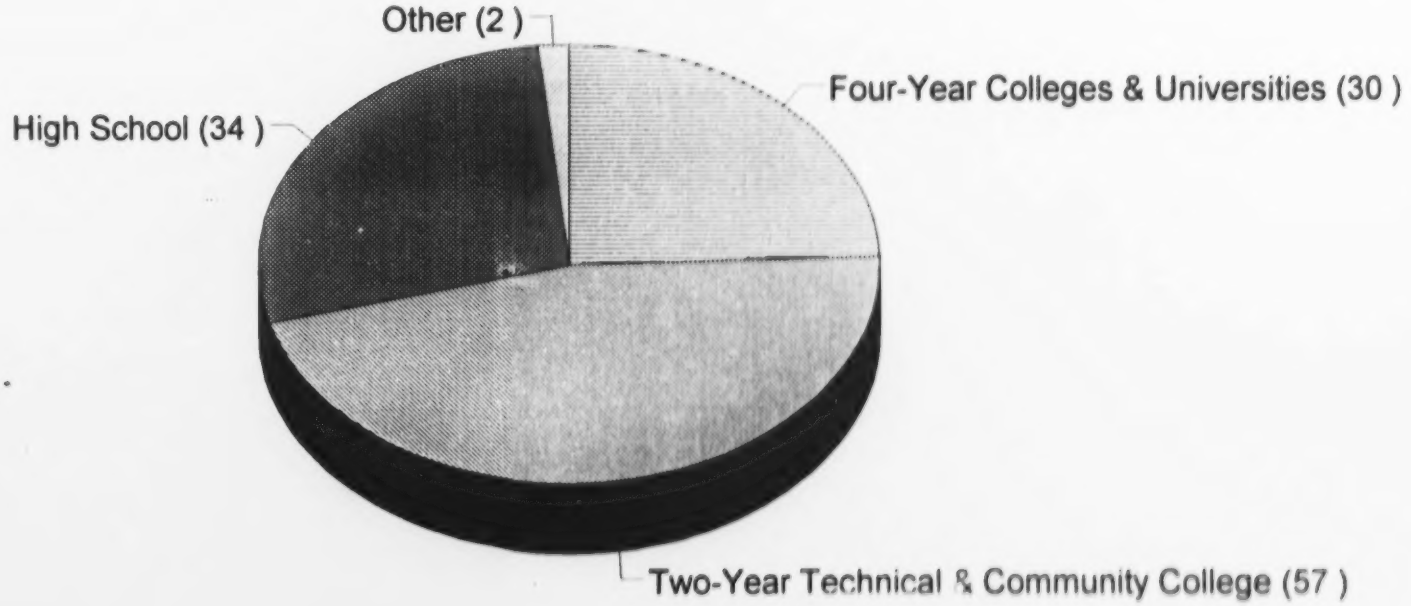
fn:etacpre3

Comparison of Entry Level Salary for Environmental Technicians (Laboratory Analysis and Environmental Sampling)

	Average Low	Average High	Lowest	Highest
Private Laboratories				
Lab Analysis	$ 16,085	$ 21,421	$ 9568	$ 41,600
Env. Sampling	$ 15,020	$ 20,456	$ 9568	$ 41,600
Manufacturers Outside RGV				
Lab Analysis	$ 21,434	$ 26,610	$ 11,440	$ 45,760
Env. Sampling	$ 20,912	$ 25,344	$ 10,400	$ 45,760
Manufacturers in RGV*				
Lab Analysis	$ 10,746	$ 15,912	$ 7,280	$ 24,.960
Env. Sampling	$ 10,833	$ 15,225	$ 6,280	$ 24,960

* Only six respondents provided salary information

Minimum Level of Education for Entry Level Environmental Technician



Laboratory Analyst

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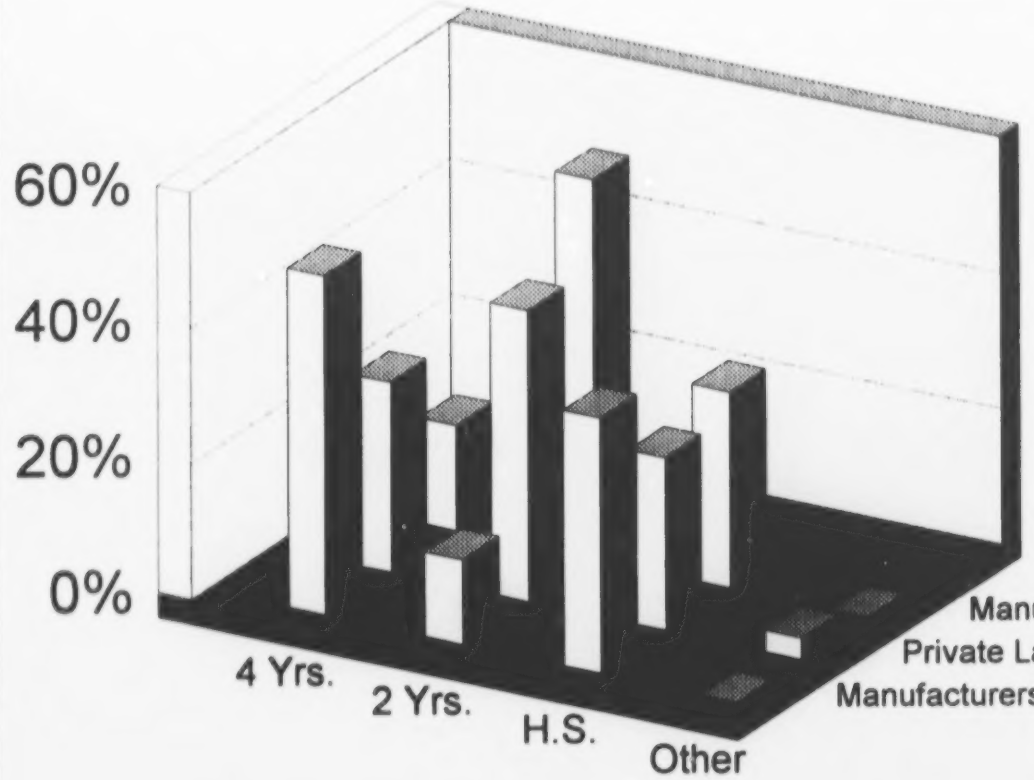
Mimimum Level of Education for
Entry Level Environmental Technician

Comparison by Group - Laboratory Analyst
Percent Distribution



Manufacturers Outside RGValley; N=52
Private Laboratories; N=63
Manufacturers In RG Valley; N=8

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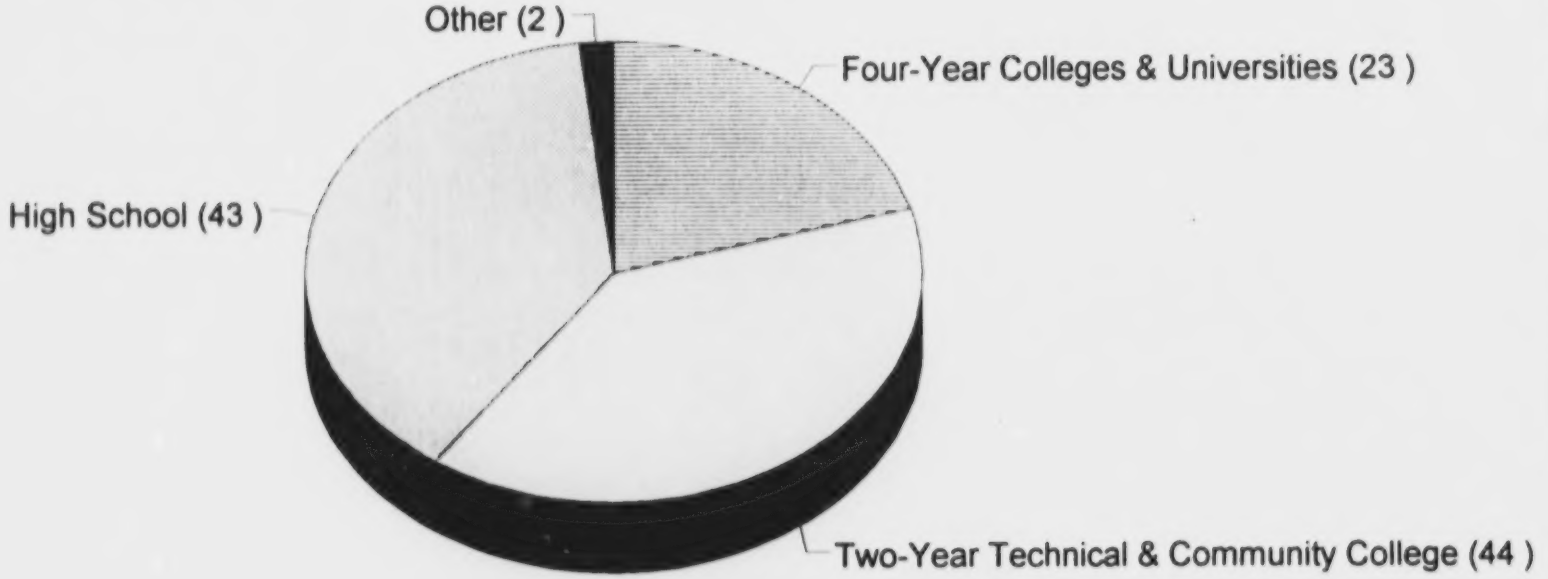
Minimum Level of Education for Entry Level Environmental Technician



Environmental Sampling

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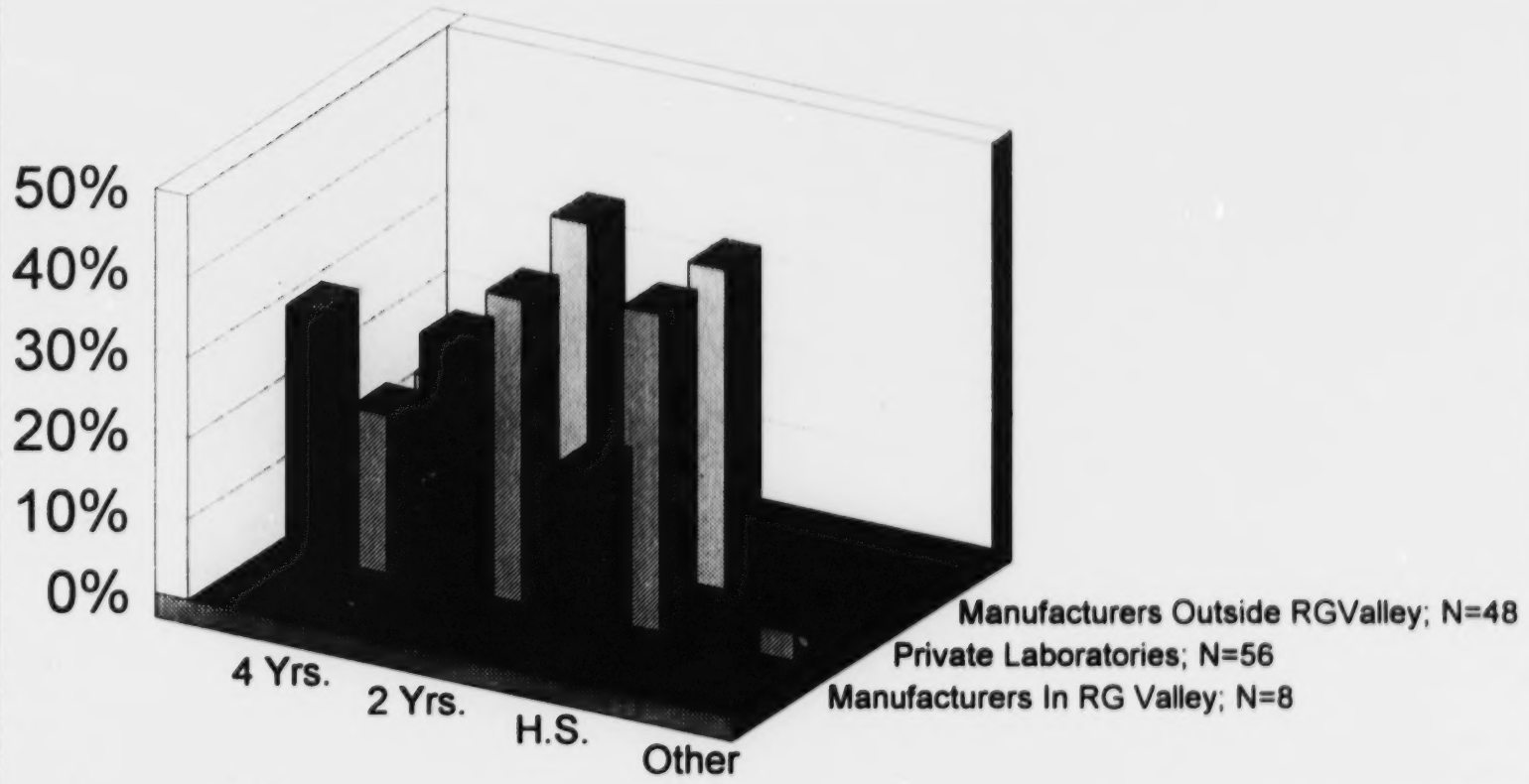
Mimimum Level of Education for Entry Level Environmental Technician

Comparison by Group - Environmental Sampling
Percent Distribution



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ENVIRONMENTAL TECHNOLOGY
(Laboratory Analysis and Environmental Sampling)

COMPARISON BY GROUP

2. Please rank the areas of greatest environmental concern to your company. Use a scale from one to three with one representing most concern and three representing the least concern.

Private Labs	TEX Man	RGV Man	All	
1.8	1.3	1.4	1.5	air quality
1.4	1.2	1.4	1.3	hazardous materials
2.6	2.8	2.6	2.7	pest control
2.3	2.6	2.7	2.4	asbestos
1.3	1.4	1.5	1.3	water quality
1.5	1.5	1.5	1.5	solid waste
1.8	1.7	1.8	1.8	water management
1.1	1.6	1.8	1.3	monitoring & testing

Private Labs	TEX Man	RGV Man	All	
2.0	1.8	1.7	1.9	sanitation/environmental health
2.6	2.0	2.5	2.3	energy
2.1	1.5	1.7	1.8	permitting
2.3	1.6	1.5	1.8	emergency response
1.9	1.3	1.2	1.5	occupational health/safety
1.9	1.5	1.5	1.7	environmental policy
2.3	2.3	2.2	2.3	land use policy
			_____	other: _____

3. Please rank the most pressing needs you have in terms of knowledge gaps in the performance of laboratory analysis, environmental sample analysis or job-related responsibilities. Use a scale from one to three with one representing most concern and three representing the least concern.

Private Labs	TEX Man	RGV Man	All	
1.6	1.6	1.5	1.6	knowledge of regulations
1.6	1.7	1.8	1.7	organic & analytical chemistry
1.9	1.9	1.8	1.9	ethical and legal responsibilities
1.9	2.0	2.0	1.9	organizational skills

Private Labs	TEX Man	RGV Man	All	
1.3	1.7	1.6	1.6	QA/QC
1.8	2.1	2.0	2.0	math skills (statistics)
1.7	1.7	1.5	1.7	writing/communication skills
1.8	1.8	2.0	1.8	computer skills
			_____	other: _____

ENVIRONMENTAL TECHNOLOGY
(Laboratory Analysis and Environmental Sampling)

COMPETENCY RATINGS
Comparison by Group
********Directions********

Please read each Competency carefully and decide whether or not the competency is required. If it is required, write the corresponding scale number in the spaces to the left of each competency.

SCALE: 1- HIGH - the job cannot be done without this
2- MEDIUM- needed to do the job
3- LOW - rarely needed to do the job

If not applicable leave the competency rating blank

TEX Man	Private Labs	All	RGV Man	
1.3	1.0	1.1	1.1	17. Use good laboratory practice and standard operating procedures
1.1	1.2	1.1	1.4	1. Practice laboratory and job safety
1.3	1.1	1.2	1.4	6. Analyze samples in accordance with regulations
1.3	1.2	1.2	1.4	16. Apply QA/QC procedures
1.4	1.1	1.3	1.3	11. Know and follow regulations and protocols
1.4	1.3	1.3	1.5	9. Calibrate and keep records of analytical instruments
1.3	1.2	1.3	1.5	5. Prepare samples
1.4	1.5	1.4	1.4	21. Manage time
1.5	1.5	1.5	1.2	19. Maintain records from collection to disposal of samples
1.5	1.4	1.5	1.6	2. Prepare reagents
1.5	1.6	1.5	1.4	22. Communicate effectively orally and in writing
1.6	1.7	1.6	1.4	3. Prepare sample container
1.6	1.7	1.6	1.5	20. Use personal computer (LIMS & PC's)
1.5	1.7	1.5	1.4	4. Perform sampling tasks from collection to disposal
1.6	1.7	1.6	1.3	7. Prepare reports
1.7	1.7	1.6	1.3	15. Interpret and evaluate data
1.7	1.8	1.8	1.7	18. Present and defend analytical results
1.8	2.1	1.9	1.7	13. Train employees
2.0	1.9	2.0	2.1	23. Drive safely
1.8	2.1	1.9	1.6	12. Develop procedures and plans
1.8	2.0	1.9	1.7	10. Maintain inventory of chemicals and reagents
2.0	1.9	2.0	1.9	8. Maintain and sterilize glass
2.4	2.3	2.3	1.7	24. Read flow sheets (unit operations)
2.5	2.5	2.4	1.9	14. Arrange contract services
_____				25. Other _____

ENVIRONMENTAL TECHNOLOGY
(Laboratory Analysis and Environmental Sampling)

EQUIPMENT USE
Comparison by Group
********Directions********

Please read each equipment item listed and decide whether or not an Environmental Technician (Laboratory Analyst and Environmental Sampling) should know how to calibrate, operate, and analyze samples. Please write the corresponding scale number in the space to the left of each item.

SCALE:
1- HIGH - the job cannot be done without this
2- MEDIUM- needed to do the job
3- LOW - rarely needed to do the job

TEX Man	Private Labs	All	RGV Man		
1.1	1.3	1.2	1.1	2.	pH Meters & Electrodes
1.2	1.2	1.2	1.2	1.	Analytical Balance
1.3	1.2	1.3	1.3	5.	Measuring Glassware (Example: Graduated & Volumetric)
1.5	1.5	1.5	1.1	28.	PC Computer
1.5	1.7	1.7	2.0	9.	Gas Chromatographs
1.7	1.5	1.6	1.3	7.	Macro & Micro Pipettes
1.7	1.6	1.6	1.2	3.	Conductivity Meters
1.7	1.6	1.6	1.3	6.	Manual Titration Burette
1.8	1.7	1.7	1.5	36.	Sampling Equipment (Specify Below))
1.6	1.9	1.7	1.3	12.	UV/VIS Spectrophotometers
1.6	1.8	1.7	1.1	23.	Computer for Wordprocessing, Spreadsheets, Graphing
1.8	1.8	1.8	1.9	31.	Mechanical (tools such as wrenches, etc)
1.9	1.8	1.8	1.3	27.	DO meter (Dissolved Oxygen)
1.7	1.9	1.8	2.3	18.	Atomic Absorption/Emission Spectrophotometers
1.6	1.9	1.8	2.1	25.	TOC Total Organic Carbon Analyzer
1.9	1.7	1.8	1.4	35.	Syringes
1.9	2.0	1.9	1.4	22.	Laboratory Information Management System
1.8	1.9	1.9	1.9	13.	Infrared Spectrophotometers
1.9	1.9	1.9	2.1	11.	Purge & Trap Sampling for Chromatography
1.9	2.1	2.0	2.4	16.	Automatic Samplers
2.1	1.8	2.0	2.6	30.	Extractors (TCLP)
2.2	2.1	2.1	1.6	4.	Centrifuge
2.1	2.0	2.1	2.9	19.	Inductively Coupled Plasma Spectrophotometers
2.0	2.4	2.2	2.0	17.	Autotitrators
2.3	1.9	2.1	1.9	29.	Mass Spectrometry (GC/MS)
2.3	2.3	2.3	1.9	33.	Column Chromatogaphy (Florisil & Silica Gel)
2.2	2.3	2.2	2.1	14.	High Performance Liquid Chromatographs
2.2	2.1	2.2	2.6	26.	TOH Total Organic Halogen Analyzer
2.2	2.3	2.2	1.7	8.	Millipore Filtration Apparatus for HPLC Solvents
2.3	2.3	2.3	1.9	10.	Photovac Portable P.I.D. for Gas Chromatographs
2.4	2.2	2.3	2.6	34.	Kaduma Danish Evaporator
2.2	2.3	2.3	2.4	15.	Ion Chromatographs
2.3	2.6	2.4	2.1	32.	Portable OVA -108 Gas Chromatograph
2.3	2.6	2.5	2.2	20.	Kinematic Viscosity Bath and Viscometers
2.5	2.6	2.5	2.5	21.	Buchii Rotavapor
2.6	2.6	2.6	2.2	24.	Gel Permeation
		37.			
		38.			
		39.			

225

ENVIRONMENTAL TECHNOLOGY
(Laboratory Analysis and Environmental Sampling)

Greatest Variance by Group

Competency Ratings:

	Private Labs	*Manufacturer's Outside RGV Area*	*Manufacturer's in RGV Area*
Prepare Reports	*1.7*	*1.6*	*1.3*
Interpret & evaluate data	1.7	1.7	1.3
Develop procedures & plans	2.1	1.8	1.6
Read flow sheets (unit operations)	1.8	2.4	1.7

ENVIRONMENTAL TECHNOLOGY
(Laboratory Analysis & Environmental Sampling)

Greatest Variance by Group

Equipment Use:

	Private Labs	*Manufacturer's Outside RGV Area*	*Manufacturer's in RGV Area*
UV/VIS Spectrophotometers	1.9	1.6	1.3
Computer for Wordprocessing, Spreadsheet, Graphing	1.8	1.6	1.1
DO Meter (Dissolved Oxygen)	1.8	1.9	1.3
Atomic Absorption/Emission Spectrophotometers	1.9	1.7	2.3
Laboratory Information Management System	2.0	1.9	1.4
Centrifuge	2.1	2.2	1.6
Inductively Coupled Plasma Spectrophotometers	2.0	2.1	2.9

ENVIRONMENTAL TECHNOLOGY
(Laboratory Analysis & Environmental Sampling)

Greatest Variance by Group

Areas of Greatest Environmental Concern:

	Private Labs	*Manufacturer's Outside RGV Area*	*Manufacturer's in RGV Area*
Air Quality	1.8	1.3	1.4
Monitoring & Testing	1.1	1.6	1.8
Emergency Response	2.3	1.6	1.5
Occupational Health/Safety	1.9	1.3	1.2

Knowledge Gaps in the Performance of Laboratory Analysis, Environmental Sampling, or Job Related Repsonsibilities:

	Private Labs	*Manufacturer's Outside RGV Area*	*Manufacturer's in RGV Area*
QA/QC	1.3	1.7	1.6

ENVIRONMENTAL TECHNOLOGY
(Laboratory Analysis and Environmental Sampling)

APPENDIX G

Tally of Mail Survey Data

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ENVIRONMENTAL TECHNOLOGY SURVEY
(Laboratory Analysis & Environmental Sampling)

Texas State Technical College - Harlingen

Codes Used in Spreadsheet

ENVIRONMENTAL TECHNOLOGY SURVEY
(Laboratory Analysis and Environmental Sampling)

The Environmental Technician utilizes knowledge of science, applied technology and QA/QC principles to determine contamination sources and methods of analysis for pollutants in air, water, and soil.Working with an industrial hygienist, engineer and chemist, the Environmental Technician conducts tests for industrial hygiene purposes; analyzes samples of air, soil and water for pollution; and performs field tests according to prescribed methods to determine characteristics or composition of solid, liquid or gaseous materials. Other tasks include writing and interpreting technical reports using knowledge of environmental regulations and hazardous waste management standards.

1. Company: Nature of business_____
Number of employees_____
Company's zip code_____

Respondent's title _____

2. Please rank the areas of greatest environmental concern to your company. Use a scale from one to three with one representing most concern and three representing the least concern.

_____air quality	A	_____sanitation/environmental health	I
_____hazardous materials	B	_____energy	J
_____pest control	C	_____permitting	K
_____asbestos	D	_____emergency response	L
_____water quality	E	_____occupational health/safety	M
_____solid waste	F	_____environmental policy	N
_____water management	G	_____land	O
_____monitoring & testing	H	_____other: _____	P

3. Please rank the most pressing needs you have in terms of knowledge gaps in the performance of laboratory analysis, environmental sample analysis or job-related responsibilities. Use a scale from one to three with one representing most concern and three representing the least concern.

_____knowledge of regulations	A	_____QA/QC	E
_____organic & analytical chemistry	B	_____math skills (statistics)	F
_____ethical and legal responsibilities	C	_____writing/communication skills	G
_____organizational skills	D	_____computer skills	H
		_____other: _____	I

4. Based on the definition at the top of the page, does your company currently have anyone assigned to work on laboratory analysis or environmental sampling, or both?
_____yes _____no

5. If you answered "yes" to question 4, how many staff in your organization work on:

Laboratory Analysis? _____persons A Both areas? C _____persons
Environmental sampling? _____persons B

6. What are the minimum qualifications in your organization for the following persons?

	Years of Work Experience	Level of Education (Degree)
person supervising Laboratory Analysis	A	E
person working in Laboratory Analysis	B	F
person supervising Environmental sampling	C	G
person working in Environmental sampling	D	H

7. What is the minimum level of formal education for entry-level Environmental Technician personnel (Laboratory Analysis & Environmental Sampling)?

LABORATORY ANALYST

_____four-year colleges and universities A
_____two-year technical and community colleges B
_____high school C
_____other (please specify) D
_____

ENVIRONMENTAL SAMPLING

_____four-year colleges and universities E
_____two-year technical and community colleges F
_____high school G
_____other (please specify) H
_____

8. Please estimate the number of Environmental Technicians your company would likely hire (new and replacement) during the next 5 years?

Laboratory Analysis: _____ A
Environmental Sampling: _____ B

9. In your company, what would be the likely range of hourly wage/salary for:

a. an entry level laboratory analyst ___A___ to ___B___

b. an entry level environmental sampling technician ___C___ to ___D___

10. What are the future education and training needs for environmental technicians (Laboratory Analysis and Environmental Sampling) in your company?_____

_____

_____

11. Would your company be interested in Environmental Technology for upgrade training or continuing education for current employees?

_____yes _____no

12. If courses in Environmental Technology were available in your geographical area as continuing education courses at night or on weekends, how many employees would your company sponsor in taking these courses?

__A__ more than ten __C__ one to five
__B__ five to ten __D__ none

13. Would you be interested in serving on an Advisory Committee for an Environmental Technology program at Texas State Technical College Harlingen?

_____yes _____no

14. Other comments:_____

_____

_____

_____

Name of person completing survey _____

Name of company _____

Address _____

Telephone Number _____

Thank you for taking the time to complete our survey. Please use the enclosed envelope to return the complete survey or return the survey to the following address:

Office of Curriculum
Texas State Technical College - Harlingen
2424 Boxwood
Harlingen, TX 78550-3697

TEXAS STATE TECHNICAL COLLEGE

ENVIRONMENTAL TECHNOLOGY (LABORATORY ANALYSIS & ENVIRONMENTAL SAMPLING)

RESP.	LTR.		NO EMPL	AREAS OF GREATEST ENVIRONMENTAL CONCERN																MOST PRESSING NEEDS								
CODE	CODE	ZIP	L/S	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	A	B	C	D	E	F	G	H	I
001	L	75002	14	3	1	1	3	2	2	1	2	1	3	1	3	2	1	1		1	1	1	2	1	2	2	3	
009	L	75061	4	1	1	3	3	3	1	3	1	2	3	3	3	2	1	3		1	2	1	2	1	2	1	2	3
013	L	75201	8	1	1	3	1	2	1	2	2	3	3	2	3	2	1	2		1	2	1	2	1	1	1	1	
018	L	75150		1	1	3	3	2	1	3	2	3	2	3	3	2	3	3		2	3	1	2	2	3	3	3	
028	L	76012		1		3							2							1		2		3				
032	L	75229	12		2		3				1														3	1	2	
034	L	75229	15	1	1	1	1	1	1	1	1	1	3	1	3	1	2	2		1	1	1	2	1	2	1	1	
035	L	75235	6	1	1	3	2	1	3	2	1	2	3	3	3	2	3	3		3	3	3	3	3	3	3	1	
038	L	75238																					1			1	2	
042	L	71247	15	3	1	1				1	1	3	1		1		1	1	1	2	2	1	3	2	3	3	3	
046	L	75702	11	3	1	3	2	1	2	2	1	3	3	2	3	2	2	3		3	1	3	2	1	2	3	2	
049	L	76004	8		1			1			1										1		1	1		1		
055	L	76504	8	1	2	2	2	1	1	1	1	1	3	1	2	2	2	2		3	1	1	1	1	1	1	1	
058	L	76903	2	1	1	2	1	1	1	1	1	1	2	1	1	1	1	1		1	2	2	2	1	1	2	1	
065	L	77011	24	1	1			1	1		1	1				2				3	1	3	3	1			1	
069	L	77021	9	2	1	2	3	1	1	2	1	2	3	2	3	3	2	2		1	2	2	3	2	1	1	2	
073	L	77025	55	1	1	2	3	1	1	1	2	1	3	2	1	2	1	1		2	1	1	1	1	1	2	1	
075	L	77029	6	1	1			1	1		1	1	1		1	1	1			1	1	1	1	1	1	2	2	
076	L	77030	16	2	1	3	3	1	2	2	1	1	3	3	2	1	1			1	1	1	2	1	2	2	2	
078	L	77502	12	1	1	1	1	1	1		1	1				1				1	3	3	3	3	3	3	3	
080	L	77036	6	3	1	3	3	1	1	1	1	2	3	1	3	3	1	2		2	1	2	2	1	2	2	2	
082	L	77040	40	2	1	3	3	1	1	2	1	2	3	3	3	2	3	3		1	2	3	2	1	2	1	1	
085	L	77063	20	1	2	3	1	2	3	2	1	2	3	2	2	1	2	3		2	1	2	1	1	2	1	1	
095	L	77055	15	2	1	3	3	2	1	3	2	3	1	3	3	1	2	3	1	2	1	3	1	1	1	1	1	
099	L	77058	7	1	3	3	1	3	3	3	1	3	3	3	3	2	2	2		2	3	2	1	1	2	1	2	
105	L	77067		2	3	3	3	1	1	1	1	2	3	2	3	3	2	2		1	3	1	3	2	2	3	3	
107	L		2		2						1			3							2	1	3					
110	L	77074		1	1	3	2	1	2	3	1	3	1	3	2	1	3	3		1	3	1	2	1	3	1	2	
111	L	77081	35	1	1	3	1	2	1	3	1	3	3	2	2	1	2	3		2	1	3	2	1	3	2	2	
113	L	78503	7	1	1	3	3	1	2	2	1	1	3	3	2	1	3	3		1	2	3	3	2	2	2	2	
116	L	77087	4	2	1	2	1	1	1	1	1	2	3	3	2	1	1	3		1	1	1	1	1	2	1	1	
118	L	77089	26	1	1	3	2	1	1	2	1	2	3	1	1	1	2	2		2	1	3	2	1	2	1	1	
134	L	77331	21	3	2	3	3	1	1	1	1	3	3	1	3	3	2	2		1	1	2	3	1	2	2	2	
136	L	77478	25	2	1	2	3	2	1	2	1	1	2	2	2	1	1	1		1	1	3	2	1	2	1	1	
139	L	77301	8	1	1	3	1	1	1	1	1	1	2	1	1	1	1	1		3	1	1	1	1	1	1	2	

TEXAS STATE TECHNICAL COLLEGE

ENVIRONMENTAL TECHNOLOGY (LABORATORY ANALYSIS & ENVIRONMENTAL SAMPLING)

RESP.	LTR.		NO EMPL	AREAS OF GREATEST ENVIRONMENTAL CONCERN															MOST PRESSING NEEDS								
CODE	CODE	ZIP	L/S	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	A	B	C	D	E	F	G	H	I
149	L	77566	8	1	2	3	3	1	1	3	1	2	3	1	3	3	2	3		2	1	1	1	2	1	1		
151	L	77571	10	1					1											1	1	1	2	1	2	2	2	
155	L	77632	31	3	2	3	3	1	1	1	1	2	3	3	2	3	2	2		1	3	2	3	1	2	2	2	
159	L	77531	4	3	1	3	3	1	2	1	1	2	2	3	3	2	3	3		1	1	3	1	1	1	2	2	
160	L	77845	23		2				1		1	2	1				3	3		2	3	3	1	1	3	3	3	
166	L	78028		3	2	3	3	1	2	1	1	1	3	2	2	3	1	2		3	2	3	3	1	1	3	1	
167	L	78155	6	3	2	3	3	1	2	1	1	1	2	2	3	3	2	3		1	1	3	2	1	1	2	2	
168	L	78283	8	3	2	2	3	1	3	1	1	1	3	2	2	3	1	1	1	1	1	1	3	1	1	1	2	
172	L	78040	4	1	2	3	2	1	2	2	1	3	3	1	1	2	2	1		1	2	1	1	1	1	1	1	
177	L	78217	1		2						1						3					1				2	3	
180	L	78207	8	3	1	3	2	1	1	1	1	2	3	1	3	1	1	3		3	2	3	2	1	3	3	3	
184	L	78228	110	1	1			2	2		1	2				2	2				1			2		3		
187	L	78238	2		1										2		3			3	1	3	1	1	1	2	2	
194	L	78228	170	1	1	3	3	1	3	3	1	3	3	3	3	2	2	3		3	1	3	3	2	1	2	1	
200	L	78403	5	2	1	3	1	1	1	2	1	2	3	3	2	2	2	2	1	2	1	3	2	1	1	1	2	2
202	L	78408	13	3	1	3	3	1	1	2	1	2	1	1	1	2	2	3		1	1	1	1	1	1	1	2	
204	L	78408	23	2	1	3	3	1	1	1	1	3	3	3	3	2	1	3		2	1	2	1	1	2	2	2	
218	L	78703	2	1	3	2	2	1	2	1	2	2	3	2	3	2	1	2		2	3	1	1	2	3	1	1	
224	L	78731	2							3		1						2					2	3		1		
226	L	78733	5					2	3		1									3			1	2				
233	L	78744	200	1	1	3	1	1	1	3	1	2	3	2	2	2	3	3		1	1	2	2	1	2	1	2	
234	L	78744	8	3	1	1	3	1	1	2	1	3	3	3	3	3	3	3		1	2	3	1	1	3	3	1	
238	L	78752	6	2	1	2	3	1	1	1	1	3	1	1	1	1	1	2		1	2						3	
238	L	78752	22	2	2	3	3	1	1	1	1	3	3	1	1	1	3	2		1	1	1	2	1	1	1	1	
241	L	78754	11		3		1		2											1	3					2		
242	L	78712	10	2	1	3	3	1	1	1	1	1	3	3	3	2	2	2		2	2	2	2	2	2	2	3	
245	L	78758	2	1	2	3	1	3	3	3	1	1	3	3	1	1	1	3		3	1	2	3	1	3	1	1	
247	L	78767	22	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1		2	1	2	2	1	1	1	1	
250	L	79101	4		2		2	2	2	3	1	3	3	3	3	1	2	3		1	3	2	2		1	1	2	
253	L	79101	2	2	1	3	3	1	1	1	1	1	3	3	3	1	1	2		1	2	1	3	1	1	1	1	
255	L	79101	11		1						1			1	1					1	1						1	
256	L	79407	10	3	1	1	3	1	1	2	1	3	3	3	3	3	1	1		1	3	3	1	1	3	3	2	
259	L	79698	7	3	1	3	3	1	1	2	1	3	3	2	2	3	3	3		1	1	1	1	1	1	3	1	
260	L	79756	8																									
261	L	79701	9		3					2	1										2			1	3			
264	L	79935	6		2			3			1										1		3	2				
266	L	79901	6	1	2	3	1	1	3	3	1	3	3	3	3	2	3	3	1	1	1	1	1	1	1	1	1	
267	L	79912	5	3	1	3	1	2	2	3	1	1	3	3	3	2	2	3		3	1					2		
LAB AVERAGE:				**1.8**	**1.4**	**2.6**	**2.3**	**1.3**	**1.5**	**1.8**	**1.1**	**2**	**2.6**	**2.1**	**2.3**	**1.9**	**1.9**	**2.3**	**1**	**1.6**	**1.6**	**1.9**	**1.9**	**1.3**	**2**	**1.7**	**1.8**	
002	M	66031		3	2											1				1	2	3						
014	M	75034	5	1	1	3	3	1	1	2	1	1	2	1	1	1	2	2		3	1	1	1	2	2	1	2	1

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TEXAS STATE TECHNICAL COLLEGE

ENVIRONMENTAL TECHNOLOGY (LABORATORY ANALYSIS & ENVIRONMENTAL SAMPLING)

RESP.	LTR.		NO EMPL	AREAS OF GREATEST ENVIRONMENTAL CONCERN																MOST PRESSING NEEDS								
CODE	CODE	ZIP	L/S	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	A	B	C	D	E	F	G	H	I
014	M	75034	7	1	1	3	3	1	1	1	1	1	3	1	2	1	1	2		3	1	3	2	1	1	1	1	
019	M	75042		1	1	3	3	1	2	2	2	1	3	2	1	1	1	3		1	1	1	3	2	2	2	2	
039	M	75090		1	1	3	3	1	1	2	1	1	1	3	1	1	1	1		1	1	3	3	2	1	1	1	
043	M	75149	1					2					3			1						3	2	1				
045	M	79110	2	1	1	3	3	1	2	1	2	2	2	2	2	1	1	2		1	2	1	2	2	2	1	2	
065	M	75668	6	1	1			1	1	1	1			1			1			1	1	1	2	1	2	2	2	
070	M	75237			2										3	1				2	1			3				
076	M	75243						1							3	2							2	1				
088	M	75220	3	2	1	3	3	2	3	3	2	1	2	1	1	1	1	1		1	2	2	1	2	2	1	1	
097	M	75006		1	3	2	3	2	3	3	2	3	3	1	2	1	1	3		1	1	3	3	3	3	3	2	
106	M	77506		1	1	3	1	2	2	2	1	1	2	1	1	1	1	2		3	1	3	3	3	1	1	1	
108	M	75607	28	1	1	3	2	1	1	2	1	2	1	1	1	1	1	3		2	1	2	2	1	1	2	2	
117	M	75963	4	1	1	2	3	1	2	3	1	1	1	1	1	1	2	3		1	2	1	3	2	3	2	2	
135	M	76110		2	1	3	3	1	2	1	2	2	2	1	1	1	1	2		1	2	1	2	2	1	1	1	
142	M	76131	3	1	1	3	3	2	2	2	2	1	2	2	2	1	2	2		1	2	2	2	2	2	1	2	
144	M	76140			2								3			1							2	1		3		
147	M	76161			3											1	2			3			2					1
154	M	76450		1	1	3	3	1	1	2	2	1	2	2	2	1	1	1		1	1	1	1	2	2	1	1	
159	M	76567	17	1	1	3	2	1	1	1	1	2	2	2	2	1	2	2		2	1	2	2	1	1	1	1	
163	M	76657		1	1	2	3	3	3	1	2	3	3	1	3	1	3	3		1	2	1	2	3	3	2	3	
164	M	78230		3	1	3	3	3	1	2	2	1	1	3	1	1	1	1		1	3	1	1	1	1	1	1	
176	M	77029	1	1	2	3	2	1	1	1	2	2	3	1	1	1	3	3		1	2	2	2	1	3	2	2	
191	M	77075	2	2	1	3	3	2	1	2	2	3	2	2	2	2	2	3		2	1	2	3	3	3	3	3	
192	M	77019		2	2	3	3	3	3	3	2	2	2	2	2	1	1	2		3	3	3	3	2	3	3	3	
205	M	77507	9	1	1	3	2	2	1	1	2	1	1	1	1	1	1	1		2	1	2	2	1	1	1	1	
206	M	77262	20	2	1	3	2	2	3	2	2	2	3	1	1	1	1	3		1	2	2	2	1	3	3	3	
216	M	77471		2	1	3	3	2	1	2	3	2	2	2	2	2	2	3		1	1	2	2	1	2	2	2	
217	M	77478		1	1	3	3	1	1	1	3	2	1	3	3	3	3	3		3	2	2	1	3	3	1	1	
223	M		5	1	1	3	1	1	1	1	1	1	2	1	1	1	1	2		3	2	1	1	1	2	1	2	
225	M	77505		1	2	2	3	3	1	3	1	2	3	1	2	3	1	3		1						3	2	
226	M	77507		3				2						1						2			3				1	
244	M	77562																										
246	M	77571	5	1	1	3	3	2	1	2	1	2	3	1	1	1	1	2		2	2	2	2	2	3	3	3	
250	M	77592	60	1	1	3	3	1	1	1	2	1	1	1	1	1	1	2			3							2
260	M	77651	19	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1		3	3	3	3	3	3	3	3	
262	M	77704	26	1	1	3	2	1	1	1	1	2	1	1	1	1	1	2		1	1	2	2	1	2	2	2	
272	M	77977	2	2	3	2	3	1	2	1	3	3	1	1	1	2	1	3		2	2	1	1	2	2	1	1	
288	M	78227		1	1	3	3	1	1	2	2	3	2	3	2	1	1	3		1	3	2	1	2	2	2	2	
292	M	78237		2										1		3												
295	M	78249		2	1	3	3	1	1	2	1	2	2	1	1	1	1	3		1	1	1	1	1	1	1	1	
299	M	78362		1	1	3	2	1	1	1	2	1	3	2	1	1	2	3		2	3	3	2	1	1	2	1	

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TEXAS STATE TECHNICAL COLLEGE

ENVIRONMENTAL TECHNOLOGY (LABORATORY ANALYSIS & ENVIRONMENTAL SAMPLING)

RESP. CODE	LTR. CODE	ZIP	NO EMPL L/S	AREAS OF GREATEST ENVIRONMENTAL CONCERN A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	MOST PRESSING NEEDS A	B	C	D	E	F	G	H	I
301	M	78403	5	1	1	3	3	1	1	2	2	1	1	1	1	1	1	3		1	2	1	3	1	3	1	2	
303	M	78410	12	1	1	2	3	1	1	1	1	2	3	2	1	1	2	3		1	1	1	2	1	2	3	2	
305	M	78409	10	1						3						2				1		3	2					
308	M	MEX	1	1	1	2	3	2	2	3	2	2	3	1	2	2	2	3		1	2	1	2	3	3	3	3	
312	M	78654	120	2	1	3	3	1	1	2	2	3	3	1	2	1	2	3		1	1	1	3	3	3	1	1	
313	M	78664	28	1	1			1			1					1				3	3			3				
320	M	78721	24	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1
323	M	78758	3		1			1	1				1								2		3	2	2	1	1	
324	M	79760	3	1	1	2	1	1	1	1	1	2	2	1	1	1	1	3		1	2	2	1	2	2	1	1	
329	M	79058	2	1	1	3	2	1	3	1	2	3	3	1	3	2	2	3		1	3	1	2	2	3	2	3	
331	M	79065		1	1	3	3	2	1	2	3	3	2	3	3	1	2	3										
335	M	79120	12	1	1	3	3	1	2	3	2	3	3	3	3	3	3	3		1	1	3	2	2	2	2	2	
345	M	79905		1	1	2	3	1	3	2	1	1	3	2	2	1	1	1		1	2	1	1	1	1	1	2	
354	M	79927	2	1	1	3	3	1	1	1	1	1	2	2	2	1	1	1		1	2	1	2	3	3	3	3	
356	M	77530	60	2	2	3	3	1	3	2	1	2	3	2	1	1	1	2		2	2	2	2	1	2	2	3	
357	M	77251	25	1	1	3	2	1	1	3	1	3	1	1	1	1	3	3		3	1	2	2	1	1	1	1	
358	M	77480	60	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1		1	2	1	1	1	2	2	2	
141	MX	77530	43	1	1	3	3	1	2	2	1	1	2	2	3	1	1	3		3	1	3	1	1	2	1	2	
144	MX	77536	3	1	2	3	3	1	2	2	2	2	1	1	1	1	2	2		1	2	3	3	2	2	1	1	
147	MX	77541	35	1	1	3	2	1	1	1	2	3	1	1	2	3	3	3	3	3	1	3	1	2	2	2	1	1
153	MX	77591	5	1	1	3	2	1	2	1	1	3	2	2	1	1	1	3		1	2	3	3	1	2	1	1	
165	MX	77979	10	1	1	2	3	1	1	2	1	1	3	1	1	1	1	2		2	3	3	3	3	3	3	2	
196	MX	78343	60	1	1	3	3	1	1	1	1	2	2	1	1	1	1	2		2	1	2	3	1	3	1	3	
211	MX	78408	36	2	1	3	3	2	3	2	1	3	3	2	1	1	1	2		1	2	1	2	1	3	3	3	
213	MX	78469	20	1	1	3	1	1	1	1	1	2	1	1	1	1	1	1		1	1	3	1	1	1	1	1	
232	MX	78741	1	1	1	3	3	1	2	2	1	2	2	1	1	1	2	3										
272	MX	79915	13					2		3		1								1			2	3				
MANUFACTURER AVERA				**1.3**	**1.2**	**2.8**	**2.6**	**1.4**	**1.5**	**1.7**	**1.6**	**1.8**	**2**	**1.5**	**1.6**	**1.3**	**1.5**	**2.3**	**2**	**1.6**	**1.7**	**1.9**	**2**	**1.8**	**2**	**1.7**	**1.8**	**1.2**
004	V	78502	2	1	1			1	3	2										2	3	1						
010	V	78503		1	1	3	3	1	3	2	2	3	3	2	3	2	1	2		1	3	1	2		2	1	1	
031	V	3679	2	1	1	3	2	1	1	1	1	1	2	1	1	1	1	1		1	1	2	2	3	2	2	3	
068	V	87350	2	1	1	3	3	1	1	2	2	2	3	1	2	2	3	2		2	2	2	2	3	2	1	1	
069	V			3	1				2											1		2	3					
070	V	78523		3	2	2	2	3	1	2	2	2	2	2	2	1	1	2		1	3	2	1	2	1	1	1	
083	V	78550		1	1	3	3	2	1	2	2	3	3	2	1	2	2	2		1	2	1	2	2	2	2	3	
085	V	78550		1	1							1				1				1		1						
086	V	78550	6	1	3	2	3	2	1	2	1	1	2	1	2	1	1	2		2	2	3	2	1	1	1	2	
089	V	78550		2	1	1	3	1	2	1	1	1	2	2	2	1	2	3		1	1	1	1	1	1	1	1	
094	V	8900		1	2	3	3	2	1	2	2	1	2	1	2	1	1	3		1	2	1	3	2	3	3	3	
105	V	78577	6		3							1	2							1	2	3						
112	V	78502		1		3		2												2		1	3					

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TEXAS STATE TECHNICAL COLLEGE

ENVIRONMENTAL TECHNOLOGY (LABORATORY ANALYSIS & ENVIRONMENTAL SAMPLING)

RESP. CODE	LTR. CODE	ZIP	NO EMPL L/S	AREAS OF GREATEST ENVIRONMENTAL CONCERN															MOST PRESSING NEEDS								
				A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	A	B	C	D	E	F	G	H	I
118	V	78593	4	1	1	3	2	1	1	2	3	2	3	2	1	1	1	1		1	1	1	3	2	3	2	2	
121	V	78599	31	2	1	3	3	2	2	3	3	2	3	3	1	1	3	3		1	3	1	2	2	3	1	2	
124	V	78521		1	1	3	2	1	1	1	2	2	3	1	1	1	1	3		1	2	1	1	2	3	1	3	
127	V	78523		1	1	2	3	1	1	1	1	1	2	2	1	1	1	1		1	1	2	1	1	1	2	2	
129	V	MEX	5	1	1	3	3	1	1	2	1	2	3	2	1	1	2	3		1	2	1	2	1	2	2	2	
VALLEY AVERAGE:				1.4	1.4	2.6	2.7	1.5	1.5	1.8	1.8	1.7	2.5	1.7	1.5	1.2	1.5	2.2		1.2	2	1.5	2	1.8	2	1.5	2	
OVERALL AVERAGE:				1.5	1.3	2.7	2.4	1.4	1.5	1.8	1.4	1.9	2.3	1.8	1.9	1.5	1.7	2.3	1.3	1.6	1.7	1.9	1.9	1.6	2	1.7	1.8	1.6

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TEXAS STATE TECHNICAL COLLEGE

ENVIRONMENTAL TECHNOLOGY (LABORATORY ANALYSIS & ENVIRONMENTAL SAMPLING)

RESP. CODE	LTR. CODE	ZIP	NO EMPL L/S	HAVE ET TECHS YES	HAVE ET TECHS NO	TECH ASSIG L	TECH ASSIG S	TECH ASSIG BTH	YRS WORK EXPERIENCE A	B	C	D	LEVEL OF EDUCATION E	F	G	H	MINIMUM LEVEL OF EDUCATION (L) A	B	C	D	MINIMUM LEVEL OF EDUCATION (S) E	F	G	H	NEW HIRES L	S
001	L	75002	14	1		12	2	1	2	1	3	1	B	H.S.	H.S.	H.S.	1					1			20	5
009	L	75061	4	1		4			5	0.5			M	B				1							2	
013	L	75201	8	1			8				2				B	B						1				1
018	L	75150			1				5	1			M	B			1					1			1	0
028	L	76012			1																					
032	L	75229	12	1		7	5	2	5	1	3	1	B	A	B	A		1				1			5	5
034	L	75229	15	1		5	10		1		1		B				1					1			10	6
035	L	75235	6	1		3	3	3	5	3	3	3	P	B	B	B	1				1				1	1
038	L	75238			1																					
042	L	71247	15	1		2	13		4	18	18		B	H	H											10
046	L	75702	11	1		10	1		3	0	1	0	B							1				1	10	2
049	L	76004	8	1					40	3	40	40	M	B	M	M			1		1				3	
056	L	76504	8		1				5	0	5	0	B	B	B	B	1				1				5	3
058	L	76903	2	1		1	1	2	3	1	2	1	B	B	B	B	1					1			1	0
065	L	77011	24	1		20	4		5	5	3	3	B	B	B	B			1				1			
069	L	77021	9	1		7	2	2	2	0	1	0	B	A	A	A		1				1			2	
073	L	77025	55	1		50	5		2	0	1	0	B	B	B	H	1						1		25	3
075	L	77029	6	1		3	3	6	10	2	14	14	A	B	H	H		1					1		1	1
076	L	77030	16	1		16	0		6	1			B	B			1								10	
078	L	77502	12	1		11	1	12	4	1	5	0	A	H.S.	H.S.	H.S.			1				1		36	12
080	L	77036	6	1		5	1		12	2	12	1	B	B	B	H	1					1				2
082	L	77040	40	1		20	20		5	1	5	1	H	H	H	H			1				1		10	10
085	L	77063	20	1		5	15		3	0	3	0	B	B	B	B	1				1				5	20
095	L	77055	15	1		12	3		5	2	2	1	A	A	A	A		1				1			10	10
099	L	77058	7	1		3	4	3	1	0	0	0	B	B	B	B			1				1		3	3
105	L	77067							3	0	3	1	B	B	B	B		1			1				3	1
107	L			1		1	1	2	2	2	2	1		A	A	H.S.		1							5	3
110	L	77074			1																					
111	L	77081	35	1		1	30		3	1	3	1							1		1				0	3
113	L	78503	7	1		4	3	3	5	10	8	8	B	A	B	B		1			1				5	5
116	L	77087	4	1		2	2	4	25	4	25	6	B		B	A		1					1		10	5
118	L	77089	26	1		22	4		7				B					1					1		6	2
134	L	77331	21	1		15	6		0	0	0	0	B	H	B	H			1						10	10
138	L	77478	25	1		25	0		3	1			B	B			1								10	
139	L	77501	8	1		8			3		3		B	A	B	H		1					1		2	

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TEXAS STATE TECHNICAL COLLEGE

ENVIRONMENTAL TECHNOLOGY (LABORATORY ANALYSIS & ENVIRONMENTAL SAMPLING)

RESP. CODE	LTR. CODE	ZIP	NO EMPL L/S	HAVE ET TECHS YES	HAVE ET TECHS NO	TECH ASSIG L	TECH ASSIG S	TECH ASSIG BTH	YRS WORK EXPERIENCE A	B	C	D	LEVEL OF EDUCATION E	F	G	H	MINIMUM LEVEL OF EDUCATION (L) A	B	C	D	(S) E	F	G	H	NEW HIRES L	S
149	L	77566	8	1		4	4	4	5	2		1	B	B			1				1				1	0
151	L	77571	10	1		10	0	10	3	3			B					1							10	0
155	L	77632	31	1		17	14	14					B	H.S.	B	H.S.			1				1		3	3
159	L	77531	4	1		2	2		35	30	30	30	A	A	A	A		1				1			1	1
160	L	77845	23	1		20	3						B	H.S.	B	H.S.			1				1		50	3
166	L	78028		1				3	5	2	5	2							1				1		1	1
167	L	78155	6	1		3	3	3					M	A	M	B		1				1			1	1
168	L	78263	8	1		6	2	4	4	2	5	1	B	A	B	A		1				1			1	0
172	L	78040	4	1		0	4				0	0			B	H						1				1
177	L	78217	1	1			1				1	1			B	B							1			2
180	L	78207	8	1		7	1	8	3	1	4	4	B		B	B	1				1				4	1
184	L	78228	110	1		100	10		10	1	10	1	P	A	B	A		1				1			25	2
187	L	78238	2	1		1	1		5	2	2	0	B	B				1							1	5
194	L	78228	170	1		150	20	20+	5	0	5	0	B		B					1				1	15	10
200	L	78403	5	1		3	2	2	5	1	5	1	B	A	B	A		1				1			10	2
202	L	78408	13	1		13	0	0	5	1			B	H.S.					1						3	0
204	L	78408	23	1		20	0	3	5	0	5	0	B	A	B	A		1				1			10	2
218	L	78703	2	1		1	1	1	5	1	5	1	B	B	B	B		1				1			2	2
224	L	78731	2	1			2		5		5		B	B	B	B	1				1				0	0
226	L	78733	5	1		5		1	6	2	6	2	B		B	B		1				1			6	2
233	L	78744	200	1		100	100	10	10	0	10	0	B	B	B	B			1				1			
234	L	78744	8	1		8	0	0	5	0				H					1						2	
236	L	78752	6	1			6				3	0			H.S.	H.S.							1			10
238	L	78752	22	1			22				3	4			B	H.S.							1			5
241	L	78754	11	1		10	1	1	3	0	3	0	B	A				1					1		20	2
242	L	78712	10	1		5	5	10					M	B	M	B		1				1			5	5
245	L	78758	2	1				2	3	2	2	3	A	A	A	A		1				1			10	10
247	L	78767	22	1		10	12		5	1	6	1	B	B	B	B	1				1				25	10
250	L	79101	4	1		1	3	3	5	1	2	1	B	H	H	H			1				1		2	
253	L	79101	2	1		2	0		1	0			B	B					1						2	0
255	L	79101	11	1		5	6		5	1	3	1	B	H	B	H			1				1		2	0
256	L	79407	10	1		10			12	3			B	B			1								10	0
259	L	79698	7	1		5	2	2	5	1	1		P	B	B		1					1			2	0
260	L	79756	8																							
261	L	79701	9	1		6	3	5	5	1	5	1	B		B			1					1		2	1
264	L	79935	6	1		6			3	0			B	B			1								5	
266	L	79901	6	1		2	4	6	3	2	2	1	M	A	H	H		1					1		1	2
267	L	79912	5	1		0	5				5	0			B	A						1			1	5
				66	5	0 806	386	132					P=3 M=6 B=44	P=0 M=0 B=26	P=0 M=3 B=35	P=0 M=1 B=18	18	27	16	2	11	21	22	2	0	444	211
									avg:	6	2.2	5.7	2.9													

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TEXAS STATE TECHNICAL COLLEGE
ENVIRONMENTAL TECHNOLOGY (LABORATORY ANALYSIS & ENVIRONMENTAL SAMPLING)

RESP. CODE	LTR. CODE	ZIP	NO EMPL L/S	HAVE ET TECHS YES	HAVE ET TECHS NO	TECH ASSIG L	TECH ASSIG S	TECH ASSIG BTH	YRS WORK EXPERIENCE A	B	C	D	LEVEL OF EDUCATION E A=8 H=1	F A=16 H=11	G A=8 H=8	H A=11 H=17	MINIMUM LEVEL OF EDUCATION (L) A	B	C	D	(S) E	F	G	H	NEW HIRES L	S
002	M	66031			1																				0	1
014	M	75034	5	1		3	2	2	2	1	2	1	B	H.S.	B	H.S.			1				1		3	3
014	M	75034	7	1		4	3	3	2	0	2	0	B	H	B	H			1				1		3	3
019	M	75042			1				5	3	5	3	B	B	B	B	1				1				1	1
039	M	75090			1				7	7	4	4	B					1				1			0	0
043	M	75149	1	1		1			5	1	5	0	B	B	B	A	1					1			1	0
045	M	79110	2	1				2	5	2	5	2	B		B				1				1		3	1
065	M	75668	6	1		3	3	3	7	7	7	7	B	B	B	B			1				1		2	2
070	M	75237			1																					
076	M	75243			1																				1	1
088	M	75220	3	1		2	1	1	3	0	3	0	B	A	B	A		1				1				
097	M	75006			1																					
106	M	77506		1																					3	3
108	M	75607	28	1		16	12	28	10	0	5	0	PhD		B				1				1			
117	M	75963	4	1		3	1	3	3	1	3	1	B	H.S.											1	0
135	M	76110			1				3	1	1	1	B	A	A	H		1				1			0	1
142	M	76131	3	1		1	2	1	5	1	1	0	B	A	B	A		1				1				
144	M	76140			1																				1	1
147	M	76161			1				2	2	2	2						1				1				
154	M	76450			1																				1	1
159	M	76567	17	1		15	2		5	0	5	2	B	A	A	H		1				1			2	1
163	M	76657			1								B	H					1							
164	M	78230			1																					
176	M	77029	1	1			1				5	1			B	A						1				
191	M	77075	2		1						5	3			A	H.S.		1				1			0	2
192	M	77019			1																					
205	M	77507	9	1		2	7	9	5	0	3	3	B	H.S.	B	B			1					1			
206	M	77262	20	1		18	2	20	5	1	2	1	B	A	B	A		1				1			2	1
216	M	77471			1				5	2	5	2	B	A	B	A					1				0	0
217	M	77478		1				20	2	0	2	0	B					1				1				
223	M		5	1		5	0		3		3		B	A	B				1						15	0
225	M	77505			1				5	1	5	1	A	A	A	A		1					1		2	0
226	M	77507	12	1		10	2			2	20	6	B	A	PhD	B		1			1				8	1
244	M	77562			1																				1	0
246	M	77571	5	1		4	1	2	10	2	5	1	M	H	B	H			1				1		1	1
250	M	77592	60	1		50	10	60	10	1	5	2	B	A	B	H.S.		1					1		5	2
260	M	77651	19	1		15	4						B	H.S.	B	H.S.			1				1			1
262	M	77704	26	1		7	6	13	5	3	3	3	B	B	H	H	1						1		2	0
272	M	77977	2	1		1	1	1		2					H			1							1	

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TEXAS STATE TECHNICAL COLLEGE

ENVIRONMENTAL TECHNOLOGY (LABORATORY ANALYSIS & ENVIRONMENTAL SAMPLING)

RESP. CODE	LTR. CODE	ZIP	NO EMPL L/S	HAVE ET TECHS YES	HAVE ET TECHS NO	TECH ASSIG L	TECH ASSIG S	BTH	YRS WORK EXPERIENCE A	YRS WORK EXPERIENCE B	YRS WORK EXPERIENCE C	YRS WORK EXPERIENCE D	LEVEL OF EDUCATION E	LEVEL OF EDUCATION F	LEVEL OF EDUCATION G	LEVEL OF EDUCATION H	MINIMUM LEVEL OF EDUCATION (L) A	(L) B	(L) C	(L) D	(S) E	(S) F	(S) G	(S) H	NEW HIRES L	NEW HIRES S
288	M	78227			1																				0	0
292	M	78237			1																				1	
295	M	78249		1				1	10		10						1				1				2	1
299	M	78362	11	1		9	2	4	10	5	10	5	B	B	B	B		1				1			2	1
301	M	78403	5	1		4	1		5	3	5	1	B	B	B	H	1						1		1	2
303	M	78410	12	1		2	10	2	5	1	5	1	B	B	B	H		1					1		2	1
305	M	78469	10	1		8	2	10	3	5	3	5	B	H	B	H			1				1		1	0
308	M	MEX	1	1		0	1					5				B					1				1	0
312	M	78654	120		1																					
313	M	78664	28	1		20	8	15	3	1	3	1	B	B	B	B	1				1				4	4
320	M	78721	24	1		12	12		5	1	5		B	H	B	H	1				1				8	1
323	M	78758	5	1		5							B	B	B	B	1				1				0	0
329	M	79058	2	1				2	4	0	4	0	B	B	B	B		1				1			0	0
331	M	79065			1																				1	1
335	M	79120	12	1		10	2		10	0	10	0	B	A	B	A		1				1			2	2
342	M	79760	27	1		24	3		5	0	5	0	B	A	B	B		1			1				1	1
345	M	79905			1													1				1			5	2
354	M	79927	2	1		1	1		4	0	4	0	B	A	B	A		1				1			4	0
356	M	77530	60	1		60	0		6	4			B	A				1							6	0
357	M	77251	25	1				25			2		B	A	A	A		1				1			5	2
358	M	77480	60	1		52	8	60	15	0	15	2	B	A	B	A		1				1			6	2
141	MX	77530	43	1		18	25	8	10	0	4	2	A	H	A	A			1				1		0	0
144	MX	77536	3	1		1	2		2	0	2	0	B	A	B	H.S.			1						0	0
147	MX	77541	35	1		25	10	35	10	3	5	3	B		B			1							2	2
153	MX	77591	5	1		4	1	5	5	0	5	0	H	H	H	H			1				1		3	2
165	MX	77979	10	1				10	3		3		B		B			1				1				
196	MX	78343	60	1		50	10	1	5	1	2	1	B		B			1					1			
211	MX	78408	36	1		30	6		5	1	5	0.5	B	H	B	H			1				1			
213	MX	78469	20	1		10	10	20	3	3	3	3	B	A	B	A		1				1			1	1
232	MX	78741	1	1				1	5	1	5	0	B	A	B	A		1				1			1	1
272	MX	79915	13	1		10	3	1					B	A	B	A		1					1		0	0
				48	22	0 515	177	368					P=1	P=0	P=1	P=0	8	29	15	0	9	20	19	0	111	52
									avg:	5.5	1.6	4.8	1.7	M=1	M=0	M=0	M=0									
														B=44	B=10	B=37	B=10									
														A=2	A=20	A=6	A=16									
														H=1	H=12	H=3	H=16									
004	V	78502	2	1		1	1											1				1			4	1
010	V	78503			1											B									0	0
031	V	3679	2	1		0	2				5	3			B	A	1					1			0	2
068	V	87350	2	1		0	2				1	2				P		1				1			1	1
069	V			1			4			2	1										1					4

TEXAS STATE TECHNICAL COLLEGE

ENVIRONMENTAL TECHNOLOGY (LABORATORY ANALYSIS & ENVIRONMENTAL SAMPLING)

RESP. CODE	LTR. CODE	ZIP	NO EMPL L/S	HAVE ET TECHS YES	HAVE ET TECHS NO	TECH ASSIG L	TECH ASSIG S	BTH	YRS WORK EXPERIENCE A	B	C	D	LEVEL OF EDUCATION E	F	G	H	MINIMUM LEVEL OF EDUCATION (L) A	B	C	D	MINIMUM LEVEL OF EDUCATION (S) E	F	G	H	NEW HIRES L	S
070	V	78523			1																					
083	V	78550			1																					
085	V	78550			1																					
086	V	78550	6	1		6							B	H					1				1		3	
089	V	78550		1				4	2	0			B	A					1						2	
094	V	8900			1						2															1
108	V	78577	6		1																				0	0
112	V	78582			1																					
118	V	78593	4	1		4	0		4	1			B	H.S.					1				1		1	1
121	V	78599	31		1																					
124	V	78521			1																					
127	V	78523			1				30	5			B	A			1				1				2	1
129	V	MEX	5	1			5				1	4			B	A	1					1			0	2
				8	10	11	14	4					P=0	P=0	P=0	P=1	4	1	3	0	3	3	2	0	13	13
									avg:	12	2	2	3 M=0	M=0	M=0	M=0										
													B=4	B=0	B=2	B=1										
													A=0	A=2	A=0	A=2										
													H=0	H=2	H=0	H=0										
				122	37	1332	577	504	avg:	7.8	1.9	4.2	2.5 P=4	P=0	P=1	P=1	30	57	34	2	23	44	43	2	568	276
									avg:	6	1.9	5	2.3 M=7	M=0	M=3	M=1										
														B=36	B=74	B=29										
														A=37	A=11	A=28										
														H=25	H=11	H=33										

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TEXAS STATE TECHNICAL COLLEGE
ENVIRONMENTAL TECHNOLOGY (LABORATORY ANALYSIS & ENVIRONMENTAL SAMPLING)

RESP. CODE	LTR. CODE	ZIP	NO EMPL L/S	"ANNUAL RATE" (LAB) LOW	(LAB) HIGH	(SAMPLER) LOW	(SAMPLER) HIGH	ACE Y	ACE N	NO SPONSOR A	B	C	D	ADV COMM Y	N
001	L	75002	14	14,560.00	18,720.00	14,560.00	18,720.00		1		1				1
009	L	75061	4	20,000.00	20,500.00										
013	L	75201	8			17,992.00	20,800.00	1				1			1
018	L	75150		18,720.00	24,960.00				1				1		1
028	L	76012							1				1		1
032	L	75229	12	18,000.00	20,000.00	18,000.00	20,000.00	1				1		1	
034	L	75229	15	20,800.00	41,600.00	20,800.00	41,600.00								1
035	L	75235	6	24,000.00		24,000.00		1					1		1
038	L	75238													
042	L	71247	15	15,000.00	20,000.00	15,000.00	20,000.00		1				1		1
046	L	75702	11	15,600.00	19,760.00	15,600.00	17,680.00							1	
049	L	76004	8										1		1
055	L	76504	8	19,760.00	21,840.00	19,760.00	21,840.00	1				1		1	
058	L	76903	2	13,520.00	20,800.00	10,400.00	14,560.00		1				1		1
065	L	77011	24	10,400.00	12,480.00	10,400.00	12,480.00	1					1		
069	L	77021	9	12,480.00	18,720.00	12,480.00	18,720.00		1				1		1
073	L	77025	55	16,640.00	20,800.00	14,560.00	16,640.00	1				1		1	
075	L	77029	6	17,680.00	19,240.00	24,960.00	31,200.00	1				1			1
076	L	77030	16					1				1		1	
078	L	77502	12	9,568.00	15,600.00	9,568.00	15,600.00	1				1		1	
080	L	77036	6	16,640.00	18,720.00	14,560.00		1				1		1	
082	L	77040	40	14,560.00	20,800.00	14,560.00	20,800.00	1				1			1
085	L	77063	20	18,720.00	20,800.00	18,720.00	20,800.00		1				1		1
095	L	77055	15	16,640.00	24,960.00	16,640.00	24,960.00	1				1		1	
099	L	77058	7	12,480.00	16,640.00	12,480.00	18,720.00	1				1			1
105	L	77067		15,600.00	20,800.00	11,440.00	20,800.00		1				1		1
107	L		2	20,800.00	31,200.00	20,800.00	31,200.00	1				1		1	
110	L	77074						1				1		1	
111	L	77081	35	14,560.00	20,800.00	14,560.00	20,800.00		1						
113	L	78503	7	12,480.00	16,640.00	16,640.00	20,800.00	1				1		1	
116	L	77087	4	16,640.00	20,800.00	14,560.00	20,800.00	1				1		1	
118	L	77089	26	15,600.00	20,800.00	15,600.00	20,800.00	1				1		1	
134	L	77331	21	9,880.00	11,440.00	11,440.00	12,480.00		1	1					1
138	L	77478	25	20,000.00	22,000.00										

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TEXAS STATE TECHNICAL COLLEGE

ENVIRONMENTAL TECHNOLOGY (LABORATORY ANALYSIS & ENVIRONMENTAL SAMPLING)

RESP. CODE	LTR. CODE	ZIP	NO EMPL L/S	*ANNUAL RATE* (LAB) LOW	(LAB) HIGH	(SAMPLER) LOW	(SAMPLER) HIGH	ACE Y	ACE N	NO SPONSOR A	B	C	D	ADV COMM Y	ADV COMM N
139	L	77501	8	33,280.00	37,440.00				1						
149	L	77566	8	20,800.00	24,960.00	10,400.00	14,560.00		1				1		1
151	L	77571	10	14,560.00	18,720.00			1				1			1
155	L	77632	31	12,480.00	16,640.00	12,480.00	16,640.00	1				1			1
159	L	77531	4						1			1			1
160	L	77845	23	10,400.00	12,480.00	12,480.00	14,560.00		1				1		1
166	L	78028		16,286.00	20,508.00	16,286.00	20,508.00		1			1			1
167	L	78155	6	14,976.00		14,976.00		1				1		1	
168	L	78283	8	14,976.00	17,680.00	14,976.00	17,680.00		1			1			1
172	L	78040	4			14,560.00	20,800.00	1				1		1	
177	L	78217	1			12,480.00	16,640.00		1			1			1
180	L	78207	8	12,480.00	16,640.00	12,480.00	16,640.00	1			1			1	
184	L	78228	110	20,000.00	25,000.00	15,000.00	20,000.00		1			1			1
187	L	78238	2	14,560.00	19,760.00	11,440.00	15,600.00	1				1		1	
194	L	78228	170	15,600.00	18,720.00	15,600.00	18,720.00	1		1					1
200	L	78403	5	15,600.00	20,800.00	15,600.00	20,800.00	1				1		1	
202	L	78408	13	10,400.00					1				1		1
204	L	78408	23	16,640.00	20,800.00	12,480.00	16,640.00	1				1			1
218	L	78703	2	12,480.00	41,600.00	10,400.00	20,800.00		1			1			1
224	L	78731	2	10,400.00	14,560.00	16,640.00	41,600.00		1			1			1
226	L	78733	5	12,480.00	20,800.00	12,480.00	20,800.00		1				1		1
233	L	78744	200	16,640.00	31,200.00	16,640.00	31,200.00	1		1					1
234	L	78744	8	16,000.00	18,000.00			1				1			1
238	L	78752	6			16,993.00	17,992.00	1				1			1
238	L	78752	22			16,640.00	24,960.00	1				1		1	
241	L	78754	11	17,992.00	20,072.00	17,992.00	20,072.00	1				1		1	
242	L	78712	10						1				1		1
245	L	78758	2	14,560.00	20,800.00	14,560.00	20,800.00	1				1		1	
247	L	78767	22	25,000.00	32,000.00	24,000.00	26,000.00	1			1			1	
250	L	79101	4	16,640.00	31,200.00	12,480.00	20,800.00	1				1			1
253	L	79101	2					1				1		1	
255	L	79101	11	13,520.00	16,640.00	11,440.00	14,560.00							1	
256	L	79407	10	20,800.00	24,960.00			1				1			1
259	L	79698	7	17,500.00	19,000.00	15,000.00	17,500.00	1						1	
260	L	79756	8												
261	L	79701	9	13,520.00	15,600.00	12,480.00	14,560.00	1				1			1
264	L	79935	6	18,000.00	20,000.00			1				1		1	
266	L	79901	6	16,640.00	20,800.00	14,560.00	16,640.00	1				1			1
267	L	79912	5	12,480.00	20,800.00	12,480.00	22,880.00	1				1			1
LAB AVERAGE:			1225	16,085.10	21,421.40	15,020.10	20,456.80	42	23	0	3	3	42	15	0	26	40

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TEXAS STATE TECHNICAL COLLEGE

ENVIRONMENTAL TECHNOLOGY (LABORATORY ANALYSIS & ENVIRONMENTAL SAMPLING)

RESP. CODE	LTR. CODE	ZIP	NO EMPL L/S	"ANNUAL RATE" (LAB) LOW	(LAB) HIGH	(SAMPLER) LOW	(SAMPLER) HIGH	ACE Y	ACE N	NO SPONSOR A	B	C	D	ADV COMM Y	N
014	M	75034	5	17,888.00	22,464.00	17,800.00	22,464.00	1				1			1
014	M	75034	7	17,880.00	22,464.00	17,800.00	22,464.00	1				1			1
019	M	75042		26,080.00		26,080.00		1			1				1
039	M	75090		16,000.00				1				1			1
043	M	75149	1						1				1		1
045	M	79110	2												
065	M	75668	6	12,480.00	14,560.00	12,480.00	14,560.00		1				1		
070	M	75237													
076	M	75243							1				1		1
088	M	75220	3	14,560.00	18,720.00	14,560.00	18,720.00	1				1			1
097	M	75006						1			1			1	
106	M	77506		24,960.00	27,040.00	24,960.00	27,040.00		1			1			1
108	M	75607	28	20,800.00	24,960.00	20,800.00	24,960.00		1			1		1	
117	M	75963	4	16,640.00	18,720.00	16,640.00	18,720.00		1				1		1
135	M	76110		16,640.00	20,800.00	12,480.00	14,560.00		1			1			1
142	M	76131	3	14,560.00	18,720.00	14,560.00	18,720.00		1						1
144	M	76140		20,800.00	24,960.00	31,200.00	41,600.00		1						1
147	M	76161						1				1			
154	M	76450							1				1		1
159	M	76567	17	20,800.00	31,200.00	16,640.00	14,560.00		1				1		1
163	M	76657		14,560.00	18,720.00	14,560.00	18,720.00	1				1			1
164	M	78230							1				1		1
176	M	77029	1	31,200.00	33,280.00	31,200.00	33,280.00		1			1			1
191	M	77075	2			37,440.00	45,760.00	1				1		1	
192	M	77019													
205	M	77507	9	31,200.00		31,200.00			1						
206	M	77262	20	33,280.00	37,440.00	33,280.00	37,400.00		1			1			1
216	M	77471						1			1				1
217	M	77478	0	20,800.00		20,800.00		1				1			1
223	M		5	33,280.00	37,440.00				1						
225	M	77505		26,000.00	36,400.00	15,600.00	23,920.00		1			1			1
226	M	77507		20,800.00	24,960.00	20,800.00	24,960.00				1			1	
244	M	77562							1			1			
246	M	77571	5	20,000.00	30,000.00	18,000.00	25,000.00		1				1		1
250	M	77592	60	16,640.00	24,960.00	16,640.00	20,800.00	1							1
260	M	77651	19	20,800.00	31,200.00	20,800.00	31,200.00	1				1			1
262	M	77704	28	24,960.00	33,280.00	24,960.00	33,280.00					1			1
272	M	77977	2	16,640.00	20,800.00				1			1			1
288	M	78227							1				1		1
292	M	78237							1				1		1
295	M	78249		16,640.00	20,800.00	16,640.00	20,800.00	1				1			1

TEXAS STATE TECHNICAL COLLEGE
ENVIRONMENTAL TECHNOLOGY (LABORATORY ANALYSIS & ENVIRONMENTAL SAMPLING)

RESP. CODE	LTR. CODE	ZIP	NO EMPL L/S	"ANNUAL RATE" (LAB) LOW	(LAB) HIGH	(SAMPLER) LOW	(SAMPLER) HIGH	ACE Y	ACE N	NO SPONSOR A	B	C	D	ADV COMM Y	N
299	M	78362	11	25,729.00	33,820.00	25,729.00	33,820.00	1				1			1
301	M	78403	5	14,560.00	18,720.00	14,560.00	18,720.00	1				1			1
303	M	78410	12	18,720.00	24,960.00	18,720.00	24,960.00	1				1			1
305	M	78469	10					1				1			1
308	M	MEX	1					1				1			1
312	M	78654	120	16,640.00	18,720.00			1				1		1	
313	M	78664	28					1							
320	M	78721	24	18,720.00	24,960.00	18,720.00	24,960.00	1			1			1	
323	M	78758	5	11,440.00	15,600.00	11,440.00	15,600.00	1				1		1	
329	M	79058	2	12,000.00	14,000.00	12,000.00	14,000.00		1				1		1
331	M	79065							1				1		1
335	M	79120	12	24,960.00	31,200.00	24,960.00	31,200.00	1				1			1
342	M	79760	27	25,000.00	35,000.00	35,000.00	45,000.00	1			1				1
345	M	79905		16,640.00	18,720.00	16,640.00	18,720.00	1				1		1	
354	M	79927	2	32,000.00	42,000.00	17,680.00	19,760.00	1				1			1
356	M	77530	60	33,280.00	45,760.00			1			1			1	
357	M	77251	25	18,720.00	22,880.00			1				1			1
358	M	77480	60						1				1	1	
141	MX	77530	43	27,000.00	30,000.00	27,000.00	30,000.00		1					1	
144	MX	77536	3					1						1	
147	MX	77541	35	24,960.00	29,120.00	24,960.00	29,120.00	1			1			1	
153	MX	77591	5	33,280.00	37,440.00	33,280.00	37,440.00		1				1		1
165	MX	77979	10	23,920.00	28,080.00	23,920.00	28,080.00	1				1			1
196	MX	78343	60					1		1				1	
211	MX	78408	36	26,000.00	31,200.00	20,800.00	26,000.00					1		1	
213	MX	78469	20	25,000.00	30,000.00	25,000.00	30,000.00		1		1				1
232	MX	78741	1	14,560.00	20,800.00	10,400.00	16,640.00	1				1		1	
272	MX	79915	13	16,800.00	24,000.00	14,400.00	21,600.00		1			1			1
MANUFACTURER AVERA			855	21,433.70	26,610.60	20,912.00	25,344.10	35	29	0 1	9	35	14	0 16	45
004	V	78502	2	12,480.00	16,640.00	12,480.00	16,640.00	1				1		1	
010	V	78503						1				1		1	
031	V	3879	2					1			1				1
068	V	87350	2	7,280.00	9,360.00	6,240.00	8,320.00	1						1	
069	V					8,320.00	11,856.00	1				1		1	
070	V	78523											1		1
083	V	78550						1				1			1
085	V	78550						1					1		1
086	V	78550	6	10,400.00	14,560.00	12,480.00		1				1		1	
089	V	78550		6,840.00	15,600.00			1					1		1
094	V	8900							1				1		1
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

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TEXAS STATE TECHNICAL COLLEGE
ENVIRONMENTAL TECHNOLOGY (LABORATORY ANALYSIS & ENVIRONMENTAL SAMPLING)

RESP. CODE	LTR. CODE	ZIP	NO EMPL L/S	"ANNUAL RATE" (LAB) LOW	(LAB) HIGH	(SAMPLER) LOW	(SAMPLER) HIGH	ACE Y	ACE N	NO SPONSOR A	B	C	D	ADV COMM Y	N
112	V	78582											1		1
118	V	78593	4	13,000.00	14,352.00	13,000.00	14,352.00	1				1			1
121	V	78599	31												
124	V	78521						1				1			1
127	V	78523		12,480.00	24,960.00	12,480.00	24,960.00	1				1		1	
129	V	MEX	5					1			1				
VALLEY AVERAGE:			58	10,746.70	15,912.00	10,833.30	15,225.60	13	2	0	2	8	6	6	10
AVERAGE:			2138	18,073.60	23,263.60	17,249.80	22,234.60	90	54	0 4	14	85	35	48	95

ENVIRONMENTAL TECHNOLOGY
(Laboratory Analysis and Environmental Sampling)

COMPETENCY RATINGS

********Directions********

Please read each Competency carefully and decide whether or not the competency is required. If it is required, write the corresponding scale number in the spaces to the left of each competency.

SCALE:
1- HIGH - the job cannot be done without this
2- MEDIUM- needed to do the job
3- LOW - rarely needed to do the job

If not applicable leave the competency rating blank

_____ 1. Practice laboratory and job safety
_____ 2. Prepare reagents
_____ 3. Prepare sample container
_____ 4. Perform sampling tasks from collection to disposal
_____ 5. Prepare samples
_____ 6. Analyze samples in accordance with regulations
_____ 7. Prepare reports
_____ 8. Maintain and sterilize glass
_____ 9. Calibrate and keep records of analytical instruments
_____ 10. Maintain inventory of chemicals and reagents
_____ 11. Know and follow regulations and protocols
_____ 12. Develop procedures and plans
_____ 13. Train employees
_____ 14. Arrange contract services
_____ 15. Interpret and evaluate data
_____ 16. Apply QA/QC procedures
_____ 17. Use good laboratory practice and standard operating procedures
_____ 18. Present and defend analytical results
_____ 19. Maintain records from collection to disposal of samples
_____ 20. Use personal computer (LIMS & PC's)
_____ 21. Manage time
_____ 22. Communicate effectively orally and in writing
_____ 23. Drive safely
_____ 24. Read flow sheets (unit operations)
_____ 25. Other _____

TEXAS STATE TECHNICAL COLLEGE

ENVIRONMENTAL TECHNOLOGY (LABORATORY ANALYSIS & ENVIRONMENTAL SAMPLING)

RESP. CODE	LTR. CODE	ZIP	NO EMPL L/S	COMPETENCY RATINGS																							
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
001	L	75002	14	1	2	3	2	1	1	3	3	2	3	1	3	3		2	1	1		1		2	3	3	2	
009	L	75061	4	1	1	1	2	1	1	2	1	1	2	1	2	2	2	1	1	1	1	1	1	1	2	3	3	
013	L	75201	8	3			2	1		2	3	1	2	1				1	2	1	1	1	1	1	1	1	1	
018	L	75150		1	1	1	2	1	1	1	2	1	3	1	1	2	3	2	2	1	1	1	3	2	2	3	3	
028	L	78012																										
032	L	75229	12	1	2	2	3	2	1	2	3	1	2	1	2	3	2	1	1	1	3	2	1	1	1	2	3	
034	L	75229	15	2	2	2	3	2	1	2	3	1	3	2	2	2	3	1	1	1	2	2	1	2	2	2	2	
035	L	75236	6	1	1	2	1	1	1	1	3	1	2	1	1	2	1	1	1	2	1	2	3	1	1	2	3	
038	L	75238																										
042	L	71247	15																									
046	L	75702	11	2	1	2	2	1	1	3	2	2	2	2	2	2	3	2	1	1	3	2	2	2	2	2	3	
049	L	76004	8	1	1	2		2	1	2		2		2					2	1								
055	L	76504	8	1	2	1	1	1	1	2	3	1	1	1	3	3	3	1	1	1	1	1	2	2	2	3	2	
056	L	76903	2	1	1	1	1	1	1	1	1	1	2	1	1	3	1	2	1	1	1	1	1	1	1	1	1	
065	L	77011	24	1	1	1	2	1	1	1	1	1	2	1	3	3		1	1	1	1	1	1	1	1	1		
069	L	77021	9	1	1	2	2	1	1	2	1	1	2	1	2	2	3	2	1	1	2	1	2	2	2	3	2	
073	L	77025	55	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	
075	L	77029	6	1	1	2	2	3	1	1	2	1	2	1	1	1	2	1	2	1	1	2	1	2	1	3	2	
076	L	77030	16	1	1	2		1	1	1	2	1	3	1	2	1	2	1	1	1	1		2	2	2	1	2	
078	L	77502	12	2	1	2	2	1	1	2	2	2	2	1	2	3	3	3	2	2	2	2	2	3	2	2	3	
080	L	77036	6	1	1	2	2	1	1	2	2	1	2	1	1	2	2	1	1	1	1	2	2	2	2	2	3	
082	L	77040	40	1	2	2	1	1	1	1	2	2	3	1	2	1	3	1	1	1	2	1	2	1	2	1	2	
085	L	77063	20	1	3	2	1	1	1	1	2	1	2	1	3	2	3	1	1	1	1	1	1	1	1	1	2	
095	L	77055	15	1	2	2	2	1	1	1	2	1	3	1	1	2	3	1	1	1	3	3	1	1	1	1	1	
099	L	77058	7	2		2	1	1	1	1		1	2	1	2	1	2	1	1	1	2	2	2	2	1	2	2	
105	L	77067		1	1	2		2	1	3		1	2	1	2	3		3	1	1	1	1	2	1	1	1	3	
107	L		2	1	1	3	2	1	1	2	1	1	2	1	2	3	3	3	1	1	3	2	2	2	2	3	2	
110	L	77074																										
111	L	77081	35	2			1		1	1		1	1	1	1	1	1	2	1	1	2	1	1	1	1	1	1	
113	L	78503	7	1	1	1	2	1	2	2	2	2	1	1	3	2	2	3	2	1	2	2	1	1	1	1	1	
116	L	77087	4	1	1	2	1	1	1	1	2	1	2	1	1	1	1	1	1	1	1	1	2	1	2	1	1	
118	L	77089	26	1	1	1	2	2	2	1	3	2	2	1	3	2	3	3	1	1	3	2	2	2	2	1	3	

TEXAS STATE TECHNICAL COLLEGE

ENVIRONMENTAL TECHNOLOGY (LABORATORY ANALYSIS & ENVIRONMENTAL SAMPLING)

RESP. CODE	LTR. CODE	ZIP	NO EMPL L/S	COMPETENCY RATINGS																							
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
134	L	77331	21	2	1	1	1	1	1	1	1	2	3	1	3	2	1	1	1	1	1	1	2	3	2	1	2	
138	L	77478	25	1	2	3	3	1	1	1	2	2	2	1	2	2	3	2	1	1	3	1	1	2	2	3	3	
139	L	77501	8	1	1	1	3	2	1	1	1	1	2	1	3	3	3	2	1	1	2	1	2	2	1	3	3	
149	L	77566	8	1	3	3	3	3	1	1	2	1	2	1	3	2	2	1	1	1	1	1	2	1	1	3	1	1
151	L	77571	10	1	2	2	3		1					1					1	1				1	2			
155	L	77632	31	1	1	1	1	1	1	3	2	1	3	2	3	2	3	2	1	1	2	2	1	1	2	1	3	
159	L	77531	4	1	1	2	1	1	1	1	1	1	1	1	1	1	3	1	1	1	1	1	3	2	1	1	1	
160	L	77845	23	1	1	2	1	1	2	1	3	1	2	1	3	1		1	1	1	2	1	1	2	2			
166	L	78028																										
167	L	78155	6	1	1	1	1	1	1	2	1	2	2	1	3	3	3	2	1	1	3	3	3	3	3	2	3	
168	L	78283	8	1	1	1	1	1	1	2	1	1	1	1	3	3	3	3	1	1	1	1	1	1	1	3	3	
172	L	78040	4																									
177	L	78217	1	1		2	2	2		2				2					1	1	3	1	1	1	1	1		
180	L	78207	8	1	2	2	3	2	2	3	1	1	2	1	1	1	3	3	1	1	3	1	2	1	1	3	3	
184	L	78228	110	1	1	1	1	1	2	3	3	2	2	1					2	1		2	3	2	3	2		
187	L	78238	2	2	1	2	2	2	1	3	3	2	3	2	1	1	3	3	1	1	1	1	3	2	2	2	3	
194	L	78228	170	1	1	1	2	1	1	1	3	1	1	1	2	1	1	1	1	1	3	1	1	1	1	3		
200	L	78403	5	1	1	1	1	1	1	2	1	1	1	2	3	3	3	2	1	1	2	1	2	2	2	2	2	
202	L	78408	13	1	1	1	3	1	1	1	1	1	1	1	1	2	3	1	1	1	1	1	1	1	1	1	3	
204	L	78408	23																									
218	L	78703	2	2	2	1	1	1	1	1	2	2	2	1	2	2	3	1	2	1	1	2	2	2	2	3	3	
224	L	78731	2	1	1	1	1	1	1	1	1	1	1	1	2	2	3	3	1	1	2	2	1	1	2	1	3	
226	L	78733	5	1	2	3	3	1	1	2		2	2	1		3			1	1		1	2	1	1		2	
233	L	78744	200	1	1	2	2	1	1	3		1	3	1	3	3		3	1	1	3	3	2			3		
234	L	78744	8	1	1	1		1	1	2		2	2	1	2	3	3	2	1	1	3	3	1	1	1	3	3	
238	L	78752	22	1	2	1	1					1		1	3	3	3	1	1		3		1	1	1	1		
238	L	78752	6	1	3	1	1	1			3	1	1	1	2	1	3		1	1		1		1	1	1	3	1
241	L	78754	11	1	1	3	2	1	1	3	2	1	2	1	2	2	3	1	1	1	2	2	1	1	1	2	2	
242	L	78712	10	1	2	2	1	2	1	2	2	2	2	1	2	2	3	2	2	1	2	2	2	2	2	2	2	
245	L	78758	2	1	2	1	1	1	1	1	3	1	2	1	3	3	2	2	1	1	1	1	2	2	1	1	2	
247	L	78767	22	1	1	2	1	1	1	2	2	1	2	1	1	1	2	1	1	1	2	2	1	1	1	2	3	
250	L	79101	4	1	3	1	1	1	1	1	2	1	3	1	1	1	2	1	2	1	1	1	2	1	1	1	2	
253	L	79101	2	1	2	2	2	1	1	2	1	1	2	1	2	2	3	2	1	1	2	1	2	2	2	3	2	
255	L	79101	11	1	1	1	2	1	1	2	1	1	2	2	3	3	3	3	1	1	3	2	1	1	1	2	3	
256	L	79407	10	1	1	3	3	1	1	1	1	1	1	1	1	2	2	1	1	1	1	1	2	1	2			
259	L	79698	7	1	1	2	1	1	1	3	2	1	3	1	1	2	3	1	1	1	1	1	1	1	2	3	2	
260	L	79756	8																									
261	L	79701	9	1	2	1	1	1	1	2	1	1	2	1	3	2	3	2	1	1	3	1	3	1	2	1	3	

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TEXAS STATE TECHNICAL COLLEGE

ENVIRONMENTAL TECHNOLOGY (LABORATORY ANALYSIS & ENVIRONMENTAL SAMPLING)

RESP. CODE	LTR. CODE	ZIP	NO EMPL L/S	COMPETENCY RATINGS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
264	L	79935	6	1	1	3		1	1	2		1	2	1	3	3		2	1	1		3	3	1	3			
266	L	79901	6																									
267	L	79912	5	1	3	1	1	2	3	1	3	1	2	1	3	2	3	3	1	2	2	2	2	1	1	2	3	
LAB AVERAGE:				**1.2**	**1.4**	**1.7**	**1.7**	**1.2**	**1.1**	**1.7**	**1.9**	**1.3**	**2**	**1.1**	**2.1**	**2.1**	**2.5**	**1.7**	**1.2**	**1**	**1.8**	**1.5**	**1.7**	**1.5**	**1.6**	**1.9**	**2.3**	**1**
002	M	66031																										
014	M	75034	7	1	1	1	1	1	2	2	1	1	1	2	2	2	3	2	1	1	2	2	1	1	1	2	3	
014	M	75034	5	1	1	1	1	1	1	2	1	1	1	2	3	1	3	2	2	1	2	1	1	1	2		3	
019	M	75042		1	2	2	1	1	1	2	2	1	2	2	3	3	3	1	2	2	2	1	1	1	2	3	3	
039	M	75090		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	3	1	1	1	1	1	1	1	
043	M	75149	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	2	2	
045	M	79110	2																									
065	M	75668	6	1	1	2	1	1	1	1		1	1	1	1	1	3	1	1	1	1	1	1	2	1	1	1	
070	M	75237		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
076	M	75243		1	1	2	1	2	2	2	2	2	2	2	2	2	3	2	2	2	2	1	2	2	2	2	3	
088	M	75220	3	1	2	2	1	1	2	1	2	1	1	2	1	2	2	1	1	1	2	1	1	1	1	2	1	
097	M	75006		1						1			1	1	1	1	1	1	1					1	1			
106	M	77506		1	1	1	1	1	1	1	2	1	1	2	3	1	3	1	2	1	3	1	1	1	2	1	3	
108	M	75607	28	2	2	2	2	1	1	2	2	1	2	1	2	2	3	1	1	2	2	2	2	2	2	3	2	
117	M	75963	4	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	
135	M	76110		1				1	1	2		2			1	1		1	1		1	1	1	1	1			
142	M	76131	3	1	2	2	2	1	2	2	2	1	2	2	3	3	2	2	2	2	2	2	2	2	1	2	3	
144	M	77536	3	1	1	1	1	1	1	2	1	1	2	1	2	3	2	2	1	1	1	1	2	1	2	3	3	
147	M	76161		1	1	2	1	2	1	1	2	1	1	1	1	1	3	3	2	1	3	1	3	2	2	3	3	
154	M	76450																										
159	M	76567	17	1	1	1	1	1	1	1	2	1	2	1	2	2	3	2	1	1	3	1	1	1	1	1	2	
163	M	76657		1	2	3	2	2	1	1	3	2	2	1	1	1	3	1	1	1	2	2	2	1	1	3	3	
164	M	78230																										
176	M	77029	1	1	3	2	1	1	3	2	3	2	2	1	1	2	1	2	1	3	3	1	2	2	1	1	1	
191	M	77075	2	2		1	1	1	1	1		3	2	2	2	2	2	2	3		2	2	2	2	2	2	3	
192	M	77019								1						1			1					1	2	2		
205	M	77507	9	1	1	1	1	1	1	1	2	1	3	1	3	2	2	1	1	1	1	1	1	1	1	1	3	
206	M	77262	20																									
216	M	77471		1		1	1			2				2	3	2						2	2	1	1			
217	M	77478	0	1	3	2	1	2	1	1	1	1	2	3	1	1	1	3	1	2	1	2	2	3	2	1	1	
223	M		5	1	2	2	2	1	1	2	3	2	2	1	3	2	3	2	1	1	2	3	2	1	1	2	3	
225	M	77505		1	2	1	3	2	1	1	3	2	3	1	2	1	3	3	1	1	2	2	1	1	2	1	3	
226	M	77507																										
244	M	77562																										

TEXAS STATE TECHNICAL COLLEGE
ENVIRONMENTAL TECHNOLOGY (LABORATORY ANALYSIS & ENVIRONMENTAL SAMPLING)

RESP. CODE	LTR. CODE	ZIP	NO EMPL L/S	COMPETENCY RATINGS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
246	M	77571	5	1	1	2	2	1	1	2	1	1	1	1	2	3	3	2	2	1	1	1	1	2	3	3	3	
250	M	77592	60																									
260	M	77651	19	1	1	1	1	1	1	3	3	1	1	3	3	3	3	3	1	1	1	1	1	1	2	1	3	
262	M	77704	26	1	1	2	2	2	1	2	2	2	2	2	1	1	2	1	1	1	1	2	2	2	3	2	3	
272	M	77977	2	1	3	1	2	2	2	1	1	1	1	1	2	3	3	1	1	1	1	1	1	1	1	1	3	
288	M	78227								1		1	2	1	1	1	3	2	1	1	3		2	2	1	3	2	
292	M	78237								2																		
295	M	78249		1	3	3	1	1	3	1	2	2	1	1	1	1	1	1	2	2	2	1	1	1	1	1	3	
299	M	78362	11	1	1	1	1	1	1	2	2	1	2	1	3	3	3	2	1	1	3	2	2	2	2	3	3	
301	M	78403	5	1	2	2	2	2	1	1	2	1	1	1	2	2	3	1	1	1	1	1	2	1	1	1	2	
303	M	78410	12	1	2	1	1	1	1	3	1	1	3	1	2	2	3	3	1	1	3	1	1	1	3	3	2	
305	M	78469	10	1	1	2	2	2	1	2	2	2	3	2	2	2	3	2	1	2	2	2	2	2	2	3	3	
308	M	MEX	1	2		2	2	1	3	1		2	2	2	2	2	3				2		2	2	2	2	2	
312	M	78654	120	1	3	1	1	1	3	2	3	1	3	1	1	1	1	1	2	1	1	1	2	2	1	3	3	
313	M	78664	28	1	1	3	1	1	1	1	2	1	1	1	1	2		1	1	1	1	1	2	1	1			
320	M	78721	24	2	2	2	2	1	1	1	2	2	1	1	2	2	2	1	1	2	1	2	1	2	1	2	2	
323	M	78758	5	1	1	1	1	1	2	1	1	2	1	1	1	2	2	2	2	1	2	1	1	1	1	3	2	
329	M	79058	2	1	2	2	1	1	1	2	3	1	2	1	1	3	3	2	2	1	1	2	2	3	1	3	2	
331	M	79065																										
335	M	79120	12	1	1	2	1	1	1	2	2	1	2	1	2	3	3	1	1	1	3	2	2	2	2	3	3	
342	M	79760	27	1	3	1	1	1	2	2	2	1	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
345	M	79905		1									1	1	1	1			1	1				1	1			
354	M	79927	2	1	2	2	2	2	1	1	3	2	1	1	1	1	2	1	1	1	1	1	2	1	2	3	2	
356	M	77530	60	1	1	3		1	1	3		3		2		3		1	1	2	3		3	2	2			
357	M	77251	25	1	1	2	2	2	2	2	3	1	2	3	2	2	2	3	1	1	2	1	1	1	1	1	3	
358	M	77480	60	1	1	1	1	1	1	2	3	2	2	2	2	2	3	2	2	1	3	2	2	1	1	1	3	
141	MX	77530	43	1	1	1	2	1	1	1	2	1	2	2	2	2	3	1	1	1	2	1	1	2	2	3	3	
144	MX	76140																										
147	MX	77541	35	1	2	2	1	1	1	1		1	2	1	2	1	3	1	1	1	2	1	2	1	1	2	3	
153	MX	77591	5	1	2	2	3	3	1	2	2	2	3	1	3	3	3	2	1	1	1	2	1	1	2	2	3	
165	MX	77979	10	1	1	3	2	1	1	1	3	1	2	1	1	2	3	1	1	1	2	3	1	1	1	2	3	
196	MX	78343	60	1	1	1	1	1	1	2	3	1	2	1	3	1	3	3	1	1	1	1	3	2	1	1	3	
211	MX	78408	36	1	3	1	2	1	1	2	3	1	2	1	1	3	3	2	1	1	1	2	3	1	2	1	2	
213	MX	78469	20	1	1	1	1	1	1	1	2	1	1	1	1	1	3	1	1	1	1	1	2	1	1	1	1	
232	MX	78741	1	1	1	2	2	1	1	2	1	1	2	1	2	2	3	3	1	1	2	2	1	2	2	3	2	
272	MX	79915	13	1	1	1	1	1	1	2	1	1	3	1	3	3	3	2	2	1	1	2	2	1	2	3	2	
MANUFACTURER AVER				**1.07**	**1.5**	**1.6**	**1.4**	**1.3**	**1.3**	**1.6**	**2**	**1.4**	**1.8**	**1.4**	**1.8**	**1.8**	**2.5**	**1.7**	**1.3**	**1.3**	**1.7**	**1.5**	**1.6**	**1.4**	**1.5**	**2**	**2.4**	
004	V	78502	2																									

TEXAS STATE TECHNICAL COLLEGE
ENVIRONMENTAL TECHNOLOGY (LABORATORY ANALYSIS & ENVIRONMENTAL SAMPLING)

RESP. CODE	LTR. CODE	ZIP	NO EMPL L/S	COMPETENCY RATINGS																							
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
010	V	78503																									
031	V	3679	2	1	2	1	1	2	1	1	3	2	1	1	1	1	1	1	2	1	3	2	2	2	1	2	2	
068	V	87350	2	1		1	2	1	1	1	2	1	1	1	1	2	3	1	1	1	1	1	1	1	2	1	1	
069	V												1			2							3					
070	V	78523																										
083	V	78550		2	2	2	2	2	1	1	2	2	2	2	2	3	2	1	2	1	2	2	1	2	1	3	2	
085	V	78550											1	2	2	1									1			
086	V	78550	6	1	1	2	1	1	1	1	1	1	2	1	1	1	1	1	1	1	2	1	1	1	1	2	2	1
089	V	78550		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
094	V	8900		1	1	1	1	1	1	2	2	1	2	1	1	2	3	1	2	1	2	1	2	2	3	3	2	
108	V	78577	6	3	3	2	2	3	3	1	2	3	2	3	3	2	3	2	1	1	2	1	3	1	2	3	3	3
112	V	78582																										
118	V	78593	4	1	1	1	1	1	1	2	1	1	3	1	3	2	3	2	1	1	1	1	1	1	2	3	2	
121	V	78599	31	1	3	1	2	2	2	2	3	3	3	1	2	2	1	1	2	2	2	1	1	1	1	1	2	
124	V	78521																										
127	V	78523		2	1	2	1	1	1	1	3	1	2	1	1	1	1	1	1	1	2	1	1	2	1	3	1	
129	V	MEX	5	1	1	1	1	1	2	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	
VALLEY AVERAGE:				1.4	1.6	1.4	1.4	1.6	1.4	1.3	1.9	1.6	1.7	1.3	1.6	1.7	1.9	1.3	1.4	1.1	1.7	1.2	1.6	1.4	1.4	2.1	1.7	2
OVERALL AVERAGE:				1.1	1.6	1.6	1.6	1.3	1.2	1.6	2	1.3	1.9	1.3	1.9	1.9	2.4	1.6	1.2	1.1	1.8	1.6	1.6	1.4	1.6	2	2.3	1.6

ENVIRONMENTAL TECHNOLOGY
(Laboratory Analysis and Environmental Sampling)

EQUIPMENT USE

********Directions********

Please read each equipment item listed and decide whether or not an Environmental Technician (Laboratory Analyst and Environmental Sampling) should know how to calibrate, operate, and analyze samples. Please write the corresponding scale number in the space to the left of each item.

SCALE:
1- HIGH - the job cannot be done without this
2- MEDIUM- needed to do the job
3- LOW - rarely needed to do the job

_____ 1. Analytical Balance
_____ 2. pH Meters & Electrodes
_____ 3. Conductivity Meters
_____ 4. Centrifuge
_____ 5. Measuring Glassware (Example: Graduated & Volumetric)
_____ 6. Manual Titration Burette
_____ 7. Macro & Micro Pipettes
_____ 8. Millipore Filtration Apparatus for HPLC Solvents
_____ 9. Gas Chromatographs
_____ 10. Photovac Portable P.I.D. for Gas Chromatographs
_____ 11. Purge & Trap Sampling for Chromatography
_____ 12. UV/VIS Spectrophotometers
_____ 13. Infrared Spectrophotometers
_____ 14. High Performance Liquid Chromatographs
_____ 15. Ion Chromatographs
_____ 16. Automatic Samplers
_____ 17. Autotitrators
_____ 18. Atomic Absorption/Emission Spectrophotometers
_____ 19. Inductively Coupled Plasma Spectrophotometers
_____ 20. Kinematic Viscosity Bath and Viscometers
_____ 21. Buchii Rotavapor
_____ 22. Laboratory Information Management System
_____ 23. Computer for Wordprocessing, Spreadsheets, Graphing
_____ 24. Gel Permeation
_____ 25. TOC Total Organic Carbon Analyzer
_____ 26. TOH Total Organic Halogen Analyzer
_____ 27. DO meter (Dissolved Oxygen)
_____ 28. PC Computer
_____ 29. Mass Spectrometry (GC/MS)
_____ 30. Extractors (TCLP)
_____ 31. Mechanical (tools such as wrenches, etc)
_____ 32. Portable OVA -108 Gas Chromatograph
_____ 33. Column Chromatogaphy (Florisil & Silica Gel)
_____ 34. Kaduma Danish Evaporator
_____ 35. Syringes
_____ 36. Sampling Equipment (Specify Below))
_____ 37. _____
_____ 38. _____
_____ 39. _____

TEXAS STATE TECHNICAL COLLEGE

ENVIRONMENTAL TECHNOLOGY (LABORATORY ANALYSIS & ENVIRONMENTAL SAMPLING)

RESP. CODE	LTR. CODE	ZIP	NO EMPL L/S	EQUIPMENT USE 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
001	L	75002	14	1	1	2	2	1	2	1	3	2	3	1	1	1	3	3	3	3	2	1	3	3	2	3	3	2
009	L	75061	4	1	1	1	1	1	2	1	3	2	1	1	1	1	3	3	3	3	2	1	3	3	2	2	3	2
013	L	75201	8	3	2	2	3	3	3	3	3	3	1	3	3	3	3	3	2	3	3					1		
018	L	75150		1	1	2	2	1	1	1	3	1	3	2	2	2	3	3	3	3	2	3	2	3	3	3	3	2
028	L	76012																										
032	L	75229	12	1	1	2	3	1	1	2	1	1	2	1	2	1	3	3	2	2	1	2	3	3	2	1	3	2
034	L	75229	15																									
035	L	75235	6	1	1	3	1	1	1	1	3	1	3	1	1	1	3	2	2	3	1	3	3	3	3	2	3	3
038	L	75238																										
042	L	71247	15	1	1	1	3	1	1	1	2	1	1	3	1	1	3	3	1	1	1	1	1	1	2	3	1	1
046	L	75702	11	1	1	1	3	1	1	1	2	2	2	2	2	2			2		2				2	2		2
049	L	76004	8	1	1	2	3	1	1	2		1		3	2	2		3			1	3	2				3	
055	L	76504	8	1	1	1	3	1	1	1	2	2	3	2	2	2	2	2	2	2	2	2	3	3	1	2	3	2
058	L	76903	2	1	1	1	2	1	1	1	1	1	2	2	1	2	2	3	3	3	2	2	3	3	3	1	3	1
065	L	77011	24	1	1	1	1	1	1	1																1		
069	L	77021	9	1	1	1	2	1	1	1	2	2			2													
073	L	77025	55	1	1	1	2	2	2	1	2	1	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
075	L	77029	6	1	2	2	2	1	2	1	1	1	1	1	2	1	1	1	2	2	2	2	2	2	1	2	2	2
076	L	77030	16	1	1	1	2	1	1	1	2	1	2	1	2	2	1	1	1	2	1	1	3	3	1	2	2	1
078	L	77502	12	2	2	2	2	2	2	2	2	1	1	1	2	2	1	1	2	2	1	1	2	2	3	3	2	2
080	L	77036	6	1	1	1	3	1	1	1	3	3	3	3	1	3	3	3	2	2	2	2	3	3	2	2	3	2
082	L	77040	40	2	2	2	2	2	2	2	2	1	1	1	1	1	3	3	3	3	3	3	3	3	3	3	3	3
085	L	77063	20	3	3	3	3	2	3	3	3	2	2	2	3	3	3	3	3	3	3	3	3	3	2	1	3	2
095	L	77055	15	1			1																					
099	L	77058	7																							1		
105	L	77067		1	1	1	1	1	1	2	3	3	3	3	2	3	3	2	2	2	2	2	1	2	2	2	3	2
107	L		2	1	1	1	2	1	1	1	2	2	3	2	2	3	2	2		2	1	1	3	3	2	2	3	1
110	L	77074																										
111	L	77081	35																									
113	L	78503	7	1	1	1	1	1	1	1	2	2	2	2	2	2	3	3	2	2	2	3	3	3	2	1	3	3
116	L	77087	4	1	1	1	1	1	1	1	1	1	3	1	1	3	1	3	2	2	1				1	1		
118	L	77089	26	2	2	2	2	2	2	2	3	2	3	2	2	2	2	2	2	2	2	2	3	3	1	3	2	2
134	L	77331	21																									
138	L	77478	25	1	1	3	2	1	3	1	3	2	3	2	3	3	3	3	2	3	3	3	3	1	1	1	2	3
139	L	77501	8	1	1	3	2	1	1	1	2	1	3	2	1	2	1	3	2	2	2	2	3	2	2	2	3	1
[redacted]	[redacted]	77[redacted]	[redacted]	[redacted]	1	2	[redacted]	1	[redacted]	[redacted]	1	[redacted]	[redacted]	[redacted]	1	[redacted]	1	[redacted]	2	[redacted]	1	2	3	3	3	2	3	1	[redacted]

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TEXAS STATE TECHNICAL COLLEGE

ENVIRONMENTAL TECHNOLOGY (LABORATORY ANALYSIS & ENVIRONMENTAL SAMPLING)

RESP. CODE	LTR. CODE	ZIP	NO EMPL L/S	EQUIPMENT USE 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
151	L	77571	10	1	1	1	2	1	1	1	2	1		1					1		1	1						1
155	L	77632	31	1	1	1	1	1	1		1	3	3	3	3	3	1	3	3	2	2	1	3	3	3	1	1	3
159	L	77531	4	1	1	3	3	1	1	1	3	3	3	3	2	3	3	3	3	3	3	3	3	3	3	3	3	3
160	L	77845	23	1	1	1	1	1	3	1		1	1	2	1	1			3	1	1	1				1		1
166	L	78028																										
167	L	78155	6	1	1	1	2	1	1	1	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3	2	3	2
168	L	78283	8	1	1	1	1	1	1	1	1	3	3	3	3	1	1	1	1	1	3	3	3	3	3	3	3	1
172	L	78040	4																									
177	L	78217	1	1	3	3		3																		1		
180	L	78207	8	2	2	2	3	1	2	2	3	2	3	2	2	2	3	2	2	3	2	2	3	3	2	1	3	2
184	L	78228	110																									
187	L	78238	2	1	1	1	1	1	2	2	2	2	1	2	1	1	2	2	2	1	2	2	2	2	2	1	2	1
194	L	78228	170	1	2	3	2	1	3	1	2	1	3	1	3	3	1	1	1	3	1	1	3	2	1	2	1	2
200	L	78403	5	1	1	1	1	1	1	1	3	3	2	2	2	3	3	3	2	2	2	2	2	2	2	2	3	3
202	L	78408	13	1	1	1	1	1	1	1	3	1	3	1	1	1	3	3	1	3	1	1	2	3	2	2	3	1
204	L	78408	23																									
216	L	78703	2	1	3	3	3	1	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	3	3
224	L	78731	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	1	2	2	2	2	3	2	2
226	L	78733	5	1	1	2	3	1	2	2	3	2	3	2	2	2	2	2	3	3	2			2		2		
233	L	78744	200	1	2	2	3	1	2	2		3		3	2	2					3	3			1	3		2
234	L	78744	8	1	1	1	3	1	1	1	3	1	3	1	1	1	3	3	1	3	1	1	3	3	2	2	3	1
238	L	78752	6	3	1	1	3	1	3	3	3	3	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
238	L	78752	22		1	1							1															
241	L	78754	11	1	1	1	1	1	1	1	3	1	3	1	1	1	1	1	1	1	1	1	3	3	1	2	1	1
242	L	78712	10	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	2	3	3	2	2	3	2
245	L	78758	2	2	3	3	3	3	3	3	2	2	3	2	3	3	3	3	2	3	3	3	3	3	1	1	3	3
247	L	78767	22	1	1	1	2	1	2	1	2	1	3	1	1	1	1	2	3	2	1	1	2	1	1	1	1	1
250	L	79101	4	1	2	2	1	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	3	3
253	L	79101	2	1	1	1	1	1	1	1	2	1	3	1	1	1	1	1	1	2	2	2	2	2	2	2	3	2
255	L	79101	11	1	1	2	3	1	1	1	3	1	2	1	3	2	3	2	2	3	1	1	3	3	2	1	3	2
256	L	79407	10	1	1	1	2	1	1	1	1	1		1	1	1	1	1	1	1	1	1		2		1		1
259	L	79698	7	1	1	1	3	2	3	2	3	1	3	1	1	1	3	2	2	2	1	1	2	3	3	1	3	1
260	L	79756	8																									
261	L	79701	9	1	1	1	2	1	1	2	3	2	3	2	2	2	3	3	3	3	2	3	1	3	2	2	3	3
264	L	79935	6	1	2	2		1	2	2	2	2		2	2	2	2	2	2		2	3		2				2
266	L	79901	6	2	2	2	3	2	2	2	3	1	3	2	2	3	3	3	3	3	2	3	3	3	2	1	3	3
267	L	79912	5	1	1	1	2	1	1	2	2	2	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	1
LAB AVERAGE:				**1.2**	**1.3**	**1.6**	**2.1**	**1.2**	**1.6**	**1.5**	**2.3**	**1.7**	**2.3**	**1.9**	**1.9**	**1.9**	**2.3**	**2.3**	**2.1**	**2.4**	**1.9**	**2**	**2.6**	**2.6**	**2**	**1.8**	**2.6**	**1.9**
002	M	66031																										
014	M	75034	5	1	1	1	1	1	1	1	3								1	2	1			2		1		
014	M	75034	7	1	1	1	1	1	1	1	3					1			1	2	1		3		3	1	3	

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TEXAS STATE TECHNICAL COLLEGE

ENVIRONMENTAL TECHNOLOGY (LABORATORY ANALYSIS & ENVIRONMENTAL SAMPLING)

RESP. CODE	LTR. CODE	ZIP	NO EMPL L/S	EQUIPMENT USE 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
019	M	75042		1	1	1	1	1	3	2	3	1	3	3	1	1	3	3	1	1	3	3	3	3	3	2	3	3
039	M			1	2	3	3	3	1	1	1	1	1	1	1	3	3	3	3	3	2	2	2	2	1	1	1	1
043	M	75149	1	1	1	2	3	1	1	1	2	2	2	2	1	1	2	2	2	2	1	2	2	2	2	1	3	2
045	M	79110	2																									
065	M	75668	6	1	1	1	2	1	2	1	3	3	3	3	1	3	3	3	1	3	1	1	3	3	3	1	3	3
070	M	75237		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
076	M	75243		1	1	2	2	2	2	3	1	1	2	2	1	1	1	1	2	2	1	1	2	2	2	2	2	1
088	M	75220	3	2	1	2	3	2	3	3	3	1	3	3	1	1	3	3	3	3	3	3	1	3	1	1	3	3
097	M	75006																										
106	M	77506		1	1	2	2	1	1	1	3	3	3	3	1	3	3	3	3	3	1	3	1	3	3	1	3	3
108	M	75607	28	2	1	2	3	2	3	2	2	1	3	1	2	2	2	1	1	1	1	1	3	3	2	2	3	1
117	M	75963	4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
135	M	76110		1	1	1	1	2	1	2	3	3	3	3	2	2	3	3	2	2	3	3	2	3	1	1	3	1
142	M	76131	3																									
144	M	76140																										
147	M	76161		1	1	3	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		3	3		
154	M	76450																										
159	M	76567	17	1	1	2	2	2	2	2	2	2	2	2	1	1	2	2	2	2	1	2	2	3	2	1	3	2
163	M	76657		1	1	3	2	1	1	2	3	3	2	1	3	1	2	1	1	2	2	2	2	1	1	2	3	
164	M	78230																										
176	M	77029	1																									
191	M	77075		2	2	2		3	2	3	2	2	2	3	2	3	2	2	3	3	3	3	3	3	2	2	3	3
192	M	77019		1	1																							
205	M	77507	9	1	1	3	2	1	3	2	2	1	1	3	2	2	2	2	1	1	1	1	3	2	1	1	3	1
206	M	77262	20																									
216	M	77471		2	1	3	3	2	3	3	3	3	3	3	2	2	3	3	2	3	3	3	3	3	3	3	3	3
217	M	77478		3	1	1	1	3	1	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1
223	M		5	1	1	2	2	1	1	1	2	1	3	2	2	2	2	3	2	2	3	2	3	2	1	2	3	1
225	M	77505		1	1	2	2	1	1	1	3	1	1	1	2	2	3	2	1	1	1	1	2	1	1	1	2	1
226	M	77507	12																									
244	M	77562																										
246	M	77571	5	1	1	1	2	1	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	3	2	1	3	2
250	M	77592	60																									
260	M	77651	19	1	1	3	3	1	1	1	3	1	3	1	1	1	1	1	1	1	3	3	3	1	1	3	1	3
262	M	77704	26	1	1	1	3	2	3	2	2	1	3	1	1	1	2	3	1	1	1	1	3	3	2	2	3	1
272	M	77977	2																									
288	M	78227																										
292	M	78237																										
295	M	78249		1	1	1	3	1	1	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	1	3	3
299	M	78362	11	1	1	1	3	1	1	1	3	1	3	1	1	3	3	3	2	1	1	3	3	3	2	2	3	1
[redacted]	M	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

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TEXAS STATE TECHNICAL COLLEGE

ENVIRONMENTAL TECHNOLOGY (LABORATORY ANALYSIS & ENVIRONMENTAL SAMPLING)

RESP. CODE	LTR. CODE	ZIP	NO EMPL L/S	EQUIPMENT USE 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
303	M	78410	12	1	1	1	3	1	1	1	3	1	3	1	1	3	3	3	3	3	1	3	3	3	1	1	3	1
305	M	78469	10	1	1	3	3	1	1	2	2								2	1	2				3	1		
308	M	MEX	1																							2		
312	M	78654	120	1	1	3	3	1	3	3	3	1	3	3	3	3	3	3	3	3	3	3	1	3	3	1	3	1
313	M	78664	28	1	1	1	1	1	1	1	1	1	1		1	1	1		1	1	1					2		
320	M	78721	24	1	1	3	3	1	2	2	2	1	3	2	2	2	1	1	1	3	2	2	3	3	2	1	3	2
323	M	78758	5	1	1	3	1	1	3	3	3	2	3	3	2	2	2	3	3	3	2	3	3	3	1	1	3	3
329	M	79058	2	1	1	1	3	1	2	2	1	1	3	3	1	1	3	3	3	3	3	3	3	3	3	1	2	2
331	M	79065																										
335	M	79120	12	1	1	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2	1	1	2	2	2	2	2	2
342	M	79760	27	2	1	2	3	2	2	2	2	2	1	1	2	2	2	2	1	2	2	2	2	2	1	1	2	2
345	M	79905		1	1	1	3	2	1	3	3	2	3	3	3	2	3	3	3	3	3	3	3	3	1	2	3	3
354	M	79927	2	1	1	1	1	1	2	2	2	1	1	1	1	1	3	3	2	2	3	3	1	3	2	1	3	1
356	M	77530	60	1	1	2	3	1	3	2	3	2	3	2	3	3	3	2	3	3	1	1	2	3	3	2	3	1
357	M	77251	25	1	2	2	3	1	3	1	2	1	2	2	3	3	2	2	2	3	3	2	3	2	2	2	3	2
358	M	77480	60	1	1	1	3	1	1	1	2	3	3	3	1	1	1	1	2	1	1	2	3	3	1	2	3	1
141	MX	77530	43	1	1	1	3	1	2	2	2	1	2	1	1	3	2	1	2	3	1	2	3	3	2	2	3	1
144	MX	77536	3	1	1	1	1	1	1	1	1	2	2	2	1	1	3	3	1	2	2	3	3	3	2	2	3	1
147	MX	77541	35	1	1	1	2	2	2	2	2	1	2	1	3	3	2	2	2	2	1	1	3	3	1	1	3	1
153	MX	77591	5	1	1	1	1	1	1	1	1	1	3	1	1	1	3	3	3	3	1	3	3	3	1	2	2	1
165	MX	77979	10	1	1	2	3	1	1	1	3	1	3	2	1	1	3	3	2	1	1	3	2	3	1	1	3	1
196	MX	78343	60	1	1	2	2	1	1	2	3	2	3	3	3	3	3	3	3	3	1	2	3	3	1	3	3	1
211	MX	78408	36	1	1	3	3	2	2	3	3	2	3	1	1	1	2	2	1	2	1	2	3	3	3	3	3	2
213	MX	78469	20	1	1	1	1	1	1	1	2	1	1	1	1	2	2	2	1	1	1	2	1	3	2	2	3	1
232	MX	78741	1	2	2	2	3	1	2	1	2	1	2	1	2	1	2	2	2	1	1	1	2	2	2	2	2	1
272	MX	79915	13	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	2	2	1	2	2	2	3	3	2	1
MANUFACTURER AVERAGE:				**1.2**	**1.1**	**1.8**	**2.2**	**1.3**	**1.7**	**1.7**	**2.2**	**1.5**	**2.3**	**1.9**	**1.6**	**1.8**	**2.2**	**2.2**	**1.9**	**2**	**1.7**	**2.1**	**2.3**	**2.5**	**1.9**	**1.6**	**2.6**	**1.6**
004	V	78502	2	1	1	1					1																	
010	V	78503																										
031	V	3679	2																									
068	V	87350	2	2	1	1	2	2	2	3	3	1	1	1	1	3	2	3	3	3	3	3	3	3	1	1	2	1
069	V	MEX	4																									
070	V	78526																										
083	V	78550																										
085	V	78550																										
086	V	78550	6	1	1	1	1	1	1	1	1	3	3	3	1	3	1	3	3	3	3	3	1	1	2	1	3	3
089	V	78550		1	1	2	1	1	1	1	1	2	1	1	1	1	2	2	1	2	2	2	2	2	1	1	1	2
094	V	8900		1	1	1	1	1	1	1	3	1	1	2	2	2	3	3	3	3	3	3	3	3	2	2	2	1
108	V	78577	6																									
112	V	78582																										
118	V	78593	4	1	1	1	2	1	1	1	1	3	3	3	1	1	3	2	3	1	2	3	3	3	2	2	2	3

TEXAS STATE TECHNICAL COLLEGE

ENVIRONMENTAL TECHNOLOGY (LABORATORY ANALYSIS & ENVIRONMENTAL SAMPLING)

RESP. CODE	LTR. CODE	ZIP	NO EMPL L/S	EQUIPMENT USE 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
121	V	78599	31																									
124	V	78521																										
127	V	78523		2	2	2	3	2	2	1	1	1	1	2	1	1	1	1	3	1	1	3	1	3	1	1	3	2
129	V	MEX	5	1	1	1	1	1	1	1	3	3	3	3	2	2	3	3	1	1	2	3			1	1		3
VALLEY AVERAGE:				1.3	1.1	1.3	1.6	1.3	1.3	1.3	1.8	2	1.9	2.1	1.3	1.9	2.1	2.4	2.4	2	2.3	2.9	2.2	2.5	1.4	1.1	2.2	2.1
OVERALL AVERAGE:				1.2	1.2	1.6	2.1	1.3	1.6	1.6	2.2	1.7	2.3	1.9	1.7	1.9	2.2	2.3	2	2.2	1.8	2.1	2.5	2.5	1.9	1.7	2.6	1.8

TEXAS STATE TECHNICAL COLLEGE

ENVIRONMENTAL TECHNOLOGY (LABORATORY ANALYSIS & ENVIRONMENTAL SAMPLING)

RESP. CODE	LTR. CODE	ZIP	NO EMPL L/S	26	27	28	29	30	31	32	33	34	35	36
001	L	75002	14	3	2	3	2	1	3	3	3	3	2	
009	L	75061	4	3	3	2	3	1	2	3	3	3	3	3
013	L	75201	8		2	1			2					1
018	L	75150		2	2	3	3	3	2	3	3	2	2	2
028	L	76012												
032	L	75229	12	2	2	1	1	1	1	2	3	2	1	
034	L	75229	15											
035	L	75235	6	3	3	2	1	1	1	3	2	1	1	1
038	L	75238												
042	L	71247	15	1	1	3	1	1	3	1	3	1	3	3
046	L	75702	11	2	2	2	2	1	2	2	3	1	1	2
049	L	76004	8				2	2	3		2	2	1	
055	L	76504	8	2	2	2	2	2	1	3	2	2	1	1
058	L	76903	2	2	1	1	2	1	1	3	2	3	1	
065	L	77011	24			1								
069	L	77021	9		2	2			2				2	
073	L	77025	55	1	1	1	1	1	1	3	1	1	2	1
075	L	77029	6	2	2	2	1	2	3	2	2	2	3	2
076	L	77030	16	3	1	1	1	1	2		1	1	1	
078	L	77502	12	1	2	2	1	2	2	1	1	2	2	2
080	L	77036	6	3	1	1	3	2	2	3	2	2	2	3
082	L	77040	40	3	3	3	3	3	3	3	3	3	3	3
085	L	77063	20	2	3	1	2	2	3	2	2	3	1	
095	L	77055	15			1			1					
099	L	77058	7			1								1
105	L	77067		2	1	1	3	3	1	3	3	3	2	
107	L		2	1	1	2	2	2	1	3	1	1	2	
110	L	77074												
111	L	77081	35											
113	L	78503	7	3	2	1	3	2	1	2	2	2	1	
116	L	77087	4		1	1	1	1	2			1	2	
118	L	77089	26	2	2	2	2	2	2	3	2	2	2	2
134	L	77331	21											
138	L	77478	25	3	3	1	2	2	2	3	1	2	1	3
139	L	77501	8	3	3	1	2	2	1	3	3	2	1	3
149	L	77566	8	1	1	1	1	1	2	2	3	2	1	1

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RESP. CODE	LTR. CODE	ZIP	NO EMPL L/S	EQUIPMENT USE 26	27	28	29	30	31	32	33	34	35	36
151	L	77571	10	1			1	1						
155	L	77632	31	1	3	1	1	3	3	2	3	3	3	
159	L	77531	4	3	1	2	3	3	1	3	3	3	1	1
160	L	77845	23		3	1	1	1	1		1	1	1	
166	L	78028												
167	L	78155	6	2	1	1	3	3	2	3	3	3	3	1
168	L	78283	8	3	1	1	3	3	1	3	3	3	1	
172	L	78040	4											
177	L	78217	1			1			2	2				1
180	L	78207	8	2	2	1	2	2	2	3	3	2	2	2
184	L	78228	110											
187	L	78238	2	1	1	1	2	1	1	1	2	2	2	1
194	L	78228	170	2	3	1	1	2	2	3	1	1	1	1
200	L	78403	5	3	2	2	3	2	1	3	3	2	1	1
202	L	78408	13	1	1	1	2	1	1	3	3	1	1	3
204	L	78408	23											
218	L	78703	2	3	3	1	3	3	2	3	3	3	3	
224	L	78731	2	2	1	1	2	2	2	2	2	2	2	2
226	L	78733	5		2	2	2	1	1		2	3	1	1
233	L	78744	200	2	2	2		2				3	3	2
234	L	78744	8	1			1	1	2	3	1	3	1	
238	L	78752	6	3	1	3	3	3	1	2	3	3	3	1
238	L	78752	22		1	1								
241	L	78754	11	1	1	2	1	1	2	3	2	1	1	1
242	L	78712	10	2	1	2	2	2	3	3	2	3	3	2
245	L	78758	2	3	3	1	3	3	3	3	3	3	1	1
247	L	78767	22	1	1	1	1	1	2	3	1	3	1	1
250	L	79101	4	3	3	2	3	3	1	3	3	3	3	2
253	L	79101	2	2	2	1	1	1	2	3	2	2	2	3
255	L	79101	11	2	2	1	1	1	1	2	3	2	1	2
256	L	79407	10	1	1	2	1	1	2		1	1	1	3
259	L	79698	7	1	1	1	1	1	3	2	1	1	1	
260	L	79756	8											
261	L	79701	9	3	1	2	3	3	1	3	3	3	2	
264	L	79935	6	2	2	3	2	2	2			2	2	
266	L	79901	6	3	2	1	3	3	2	3	2	3	2	1
267	L	79912	5	3	1	1	3	3	1	1	3	3	3	1
LAB AVERAGE:				2.1	1.8	1.5	1.9	1.8	1.8	2.6	2.3	2.2	1.7	1.7
002	M	66031												
014	M	75034	5			1		1	1					
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
014	M	75034	7			1	2	1	1			2		

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ENVIRONMENTAL TECHNOLOGY (LABORATORY ANALYSIS & ENVIRONMENTAL SAMPLING)

RESP. CODE	LTR. CODE	ZIP	NO EMPL L/S	EQUIPMENT USE 26	27	28	29	30	31	32	33	34	35	36
019	M	75042		3	3	1	3	3	2	3	2	3	2	
039	M			1	2	2	3	3	1	1	1	2	3	3
043	M	75149	1	2	2	1	2	2	2	2	2	3	2	
045	M	79110	2											
065	M	75668	6	3	1	1	3	3	2	3	3	3	3	1
070	M	75237		1	1	1	1	1	1	1	1	1	1	1
076	M	75243		1	1	3	1	1	2	1	1	2	2	
088	M	75220	3	3	1	1	3	3	2	3	2	2	1	
097	M	75006												
106	M	77506		3	3	1	3	3	1	3	3	3	1	3
108	M	75607	28	3	2	1	1	1	2	2	3	1	1	2
117	M	75963	4	1	1	1	1	1	1	1	1	1	1	1
135	M	76110		2		1			3					
142	M	76131	3											
144	M	76140												
147	M	76161				3		1		3				1
154	M	76450												
159	M	76567	17	2	2	1	3	2	1	3	3	3	2	2
163	M	76657				2								
164	M	78230												
176	M	77029	1											
191	M	77075		3	3	2	3	2	2	3	3	3	3	2
192	M	77019												
205	M	77507	9	2	3	1	2	1	1	1	1	2	1	
206	M	77262	20											
216	M	77471		3	3	1	3	3	3	3	3	3	3	
217	M	77478		1	1	1	1	1	1	1	1	1	3	
223	M		5	2	3	1	3	3	1	3	3	2	1	
225	M	77505		1	1	1	2	2	2	1	2	3	2	1
226	M	77507	12											
244	M	77562												
246	M	77571	5	3	3	1	2	3	1	3	3	3	2	
250	M	77592	60											
260	M	77651	19	1	1	3	3	1	3	3	3	1	1	1
262	M	77704	26	2	3	2	1	1	2	3	2	1	1	3
272	M	77977	2											
288	M	78227												
292	M	78237												
295	M	78240		3	3	1	3	3	1	3	3	3	3	
299	M	78362	11	3	2	2	3	3	2	3	3	3	1	3
301	M	78403	5	1	1	2	1	1	3	2	2	2	2	2

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RESP. CODE	LTR. CODE	ZIP	NO EMPL L/S	EQUIPMENT USE 26	27	28	29	30	31	32	33	34	35	36
303	M	78410	12	3	1	2	3	3	2	3	3	3	2	2
305	M	78469	10		2	1							2	
308	M	MEX	1											2
312	M	78654	120	3	3	1	3	1	1	3	3	3	3	1
313	M	78664	28		2	2	1	1	3				3	
320	M	78721	24	2	2	1	1	3	1	1	1	3	1	1
323	M	78758	5	3	1	1	2	3	1	3	1	3	1	1
329	M	79058	2	2	1	2	3	3	1	3	2	3	2	1
331	M	79065												
335	M	79120	12	2	2	2	3	2	2	3	2	2	2	
342	M	79760	27	2	2	1	2	2	1	1	3	3	2	1
345	M	79905		3	3	3	3	3	2	3	3	3	3	3
354	M	79927	2	3	3	1	3	2	3	1	3	3	3	3
356	M	77530	60	3	3	2	3	3	3	3	3	3	2	3
357	M	77251	25	2	3	1	2	3	2	2	2	2	1	
358	M	77480	60	2	1	1	3	2	1	3	3	3	2	
141	MX	77530	43	3	1	1	3	3	3	2	2	3	1	
144	MX	77536	3	2	1	1	3	2	1	1	3	1	1	1
147	MX	77541	35	3	1	1	1	1	2	3	2	3	1	
153	MX	77591	5	1	2	2	3	3	3	3	3	3	2	2
165	MX	77979	10	3	1	1	2	3	1	2	3	3	1	2
196	MX	78343	60	3	1	3	3	3	3	3	3	3	3	2
211	MX	78408	36	2	1	3	2	1	3	3	2	2	2	1
213	MX	78469	20	2	1	2	2	2	2	1	2	3	1	
232	MX	78741	1	1	2	1	1	1	3	2	2	1	2	
272	MX	79915	13	2	2	2	3	2	2	3	3	3	2	
MANUFACTURER AVERAGE:				**2.2**	**1.9**	**1.5**	**2.3**	**2.1**	**1.8**	**2.3**	**2.3**	**2.4**	**1.9**	**1.8**
004	V	78502	2				1				1			
010	V	78503												
031	V	3679	2											
068	V	87350	2	2	1	1	2	2	1	1	2	3	1	1
069	V	MEX	4											
070	V	78526												
083	V	78550												
085	V	78550												
086	V	78550	6	3	1	1	3	3	2	3	3	3	2	1
089	V	78550		2	2	1	1	2	2	2	1	2	1	1
094	V	8900		3	2	2	1	3	1	3	1	3	1	3
108	V	78577	6											
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
118	V	78593	4	3	1	1	3	3	2	3	3	2	1	

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RESP. CODE	LTR. CODE	ZIP	NO EMPL L/S	EQUIPMENT USE 26	27	28	29	30	31	32	33	34	35	36
121	V	78599	31											
124	V	78521												
127	V	78523		2	1	1	1	2	3	1	2	3	3	2
129	V	MEX	5	3	1	1	3	3	2	2	2	2	1	1
VALLEY AVERAGE:				2.6	1.3	1.1	1.9	2.6	1.9	2.1	1.9	2.6	1.4	1.5
OVERALL AVERAGE:				2.2	1.8	1.5	2.1	2	1.8	2.4	2.3	2.3	1.8	1.7

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ENVIRONMENTAL TECHNOLOGY
(Laboratory Analysis and Environmental Sampling)

APPENDIX H

1. Bibliography

2. Guide to Enviro-Acronyms

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GUIDE TO
ENVIRO–ACRONYMS

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Environmental Consulting, Engineering & Management

ACL: Alternate Concentration Limit
ACM: Asbestos Containing Material
AHERA: Asbestos Hazard Emergency Response Action
ALJ: Administrative Law Judge
ANPR: Advance Notice of Proposed Rulemaking
AP.42: Compilation of Air Pollutant Emission Factors
APA: Administrative Procedure Act
API: American Petroleum Institute
AQCR: Air Quality Control Region
AQL: Acceptable Quality Level
ARARs: Applicable or Relevant and Appropriate Requirements
AST: Aboveground Storage Tank
ASTM: American Society for Testing and Materials
ATSDR: U.S. Agency for Toxic Substances and Disease Registry
BACT: Best Available Control Technology (air)
BAT: Best Available Technology Economically Achievable (water)
BCT: Best Conventional Pollutant Control Technology (water)
BMP: Best Management Practice
BOD: Biological Oxygen Demand
BPJ: Best Professional Judgement
BPT: Best Practicable Control Technology Currently Available (water)
BTU: British Thermal Unit
CAA: Clean Air Act (1955, 1977)
CAIR: Comprehensive Assessment Information Rule
CAMU: Corrective Action Management Union
CAS: Chemical Abstracts Service
CEM: Continuous Emission Monitoring
CEQ: Council on Environmental Quality
CERCLA: Comprehensive Environmental Response, Compensation and Liability Act (1980)
CERCLIS: Comprehensive Environmental Response and Liability Information System
CFCs: Chlorofluorocarbons
CFR: Code of Federal Regulations
CGL: Comprehensive General Liability
CLP: Contract Laboratory Program
CMS: Corrective Measures Study
COD: Chemical Oxygen Demand
CPP: Continuing Planning Process
CUP: Coastal Use Permit
CWA: Clean Water Act (1972)
CWT: Central Wastewater Treatment
DEQ: Department of Environmental Quality
DNR: Department of Natural Resources
DOD: Department of Defense
DOE: Department of Energy
DOI: Department of Interior
DOT: Department of Transportation
DRE: Destruction or Removal Efficiency
ECSL: Enforcement Compliance Schedule Letter
EHS: Extremely Hazardous Substance
EIQ: Emissions Inventory Questionnaire
EIS: Environmental Impact Statement
EP-Toxicity: Toxicity Test Performed on RCRA Wastes Prior to EPS's Adoption of TCLP as the Test Standard in March 1990
EPA: Environmental Protection Agency
ERNS: Emergency Response Notification System
ESA: Environmental Site Assessment/Audit
ESECA: Energy Supply and Environmental Coordination Act
FDF: Fundamentally Different Factors
FIFRA: Federal Insecticide, Fungicide and Rodenticide Act (1972, 1988)
FINDS: Facility Index System
FIP: Federal Implementation Plan
FOIA: Freedom of Information Act
FR: Federal Register
FTP: Federal Test Procedure
FWPCA: Federal Water Pollution Control Act
FWQC: Federal Water Quality Criteria
GEP: Good Engineering Practice
HCFC: Halogenated Chlorofluorocarbon
HCS: Hazard Communication Standard OSHA Standard (29 CFR 1910.1200)
HMR: Hazardous Materials Regulations
HON: Hazardous Organic National Emissions Standard for Hazardous Air Pollutants
HRS: Hazard Ranking System
HSP: Health and Safety Plan
HSWA: Hazardous and Solid Waste Amendments (1984)
I/M: Inspection and Maintenance
ICR: Industrial Cost Recovery
IRC: Internal Revenue Code
LAER: Lowest Achievable Emission Rate (air)
LUST: Leaking Underground Storage Tank
MACT: Maximum Available Control Technology (air)
MCL: Maximum Contaminant Level
MCLG: Maximum Contaminant Level Goal
MEI: Maximum Exposed Individual
MMS: U.S. Minerals Management Service
MOA: Memorandum of Agreement
MOD: Manufacturers Operations Division
MSDS: Material Safety Data Sheet
MSED: Mobile Source Enforcement Division of EPA
NAAQS: National Ambient Air Quality Standards
NCP: National Contingency Plan (National Oil and Hazardous Substances Pollution Contingency Plan)
NEPA: National Environmental Policy Act (1970)
NESHAP: National Emissions Standards for Hazardous Air Pollutants
NHTSA: National Highway Traffic Safety Administration
NIOSH: National Institute for Occupational Safety and Health
NOAA: National Oceanic and Atmospheric Administration
NODs: Notice of Deficiencies
NORM: Naturally Occurring Radioactive Materials
NOW: Nonhazardous Oilfield Waste
NPDES: National Pollutant Discharge Elimination System
NPL: National Priorities List
NPR: Notice of Proposed Rulemaking
NRC: Nuclear Regulatory Commission
NRT: National Response Team
NSPS: New Source Performance Standard
OCS: Outer Continental Shelf
OMB: Office of Management and Budget
OSC: On-Scene Coordinator
OSH ACT: Occupational Safety and Health Act
OSHA: Occupational Safety and Health Administration
OSM: Office of Surface Mining Reclamation and Enforcement
PAIR: Preliminary Assessment Information Rule
PART B PERMIT: The Second, Narrative Section Submitted by Generators in the RCRA Permitting Process
PCB: Polychlorinated Biphenyl
PEL: Permissible Exposure Limit
pH: Value of Acidity and Alkalinity
PMN: Premanufacture Notice
PNA: Polynuclear Aromatic
POTW: Publicly Owned Treatment Works
ppb: parts per billion
PPE: Personal Protective Equipment
ppm: parts per million
ppq: parts per quadrillion
ppt: parts per trillion
PRP: Potentially Responsible Party
PSD: Prevention of Significant Deterioration
QA/QC: Quality Assurance/Quality Control
RACM: Reasonably Available Control Measures
RACT: Reasonably Available Control Technology
RAP: Remedial Action Plan
RCRA: Resource Conservation and Recovery Act (1976)
RCRIS: Resource Conservation and Recovery Act, Notifier List
RFA: RCRA Facility Assessment
RFI: RCRA Facilities Investigation
RI/FS: Remedial Investigation and Feasibility Study
RIM: Regulation Interpretation Memorandum
ROD: Record of Decision
RPM: Remedial Project Manager
RQ: Reportable Quantity
SARA TITLE III: Designates Requirements for Public Disclosure of Chemical Information and Development of Emergency Response Plans
SARA: Superfund Amendments and Reauthorization Act (1986)
SCAP: Superfund Comprehensive Accomplishments Plan
SDWA: Safe Drinking Water Act
SEA: Selective Enforcement Auditing
SEC: Securities Exchange Commission
SETS: Superfund Enforcement Tracking System
SIC: Standard Industrial Classification
SIP: State Implementation Plan
SITE: Superfund Innovative Technology Evaluation
SLCRMA: State and Local Coastal Resource Management Act
SMCRA: Surface Mining Control and Reclamation Act
SNUN: Significant New Use Notice
SOCMI: Synthetic Organic Chemical Manufacturing Industry
SOP: Standard Operating Procedures
SPCC: Spill Prevention Control and Countermeasures Plan
SQG: Small-Quantity Generator
STEL: Short-Term Exposure Limit
SWPPP: Stormwater Pollution Prevention Plan
SUPERFUND: See CERCLA
SWDA: Solid Waste Disposal Act
SWMU: Solid Waste Management Unit
TCLP: Toxicity Characteristic Leaching Procedure
TITLE III: Emergency Planning and Community Right-to-Know Act
TSCA: Toxic Substances Control Act (1976)
TSDF: Treatment, Storage or Disposal Facility
TSP: Total Suspended Particulate
TSS: Total Suspended Solids
TWA: Time-Weighted Average
USC: United States Code
UIC: Underground Injection Control
USGS: U.S. Geological Survey
UST: Underground Storage Tank
VOC: Volatile Organic Compound
WQM: Water Quality Management
WQS: Water Quality Standards

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